AN ARGUS SPECIALIST PUBLICATION

August 1985

3.90

A&B COMPUTING

£1.25

FOR USERS OF THE BBC MICRO AND ELECTRON

Graphic Design -
How it's done

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Mosaic
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Touch of Class

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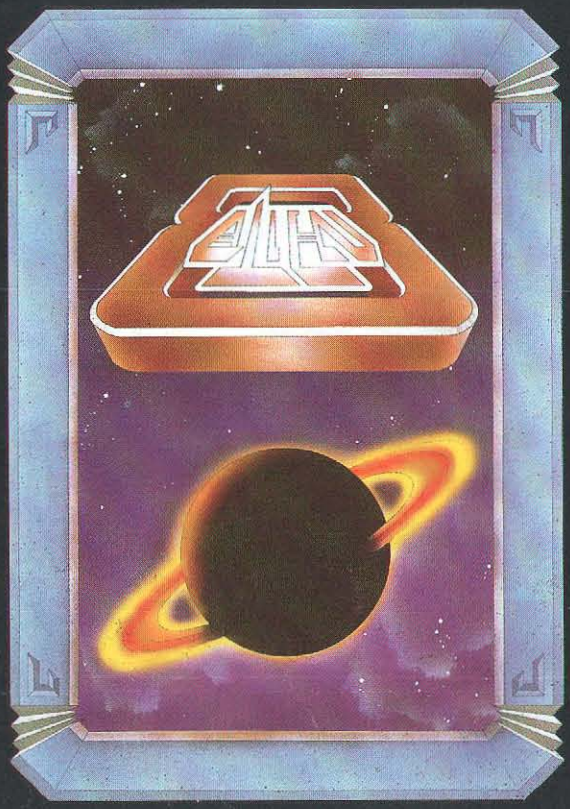
Graphics Extension ROM

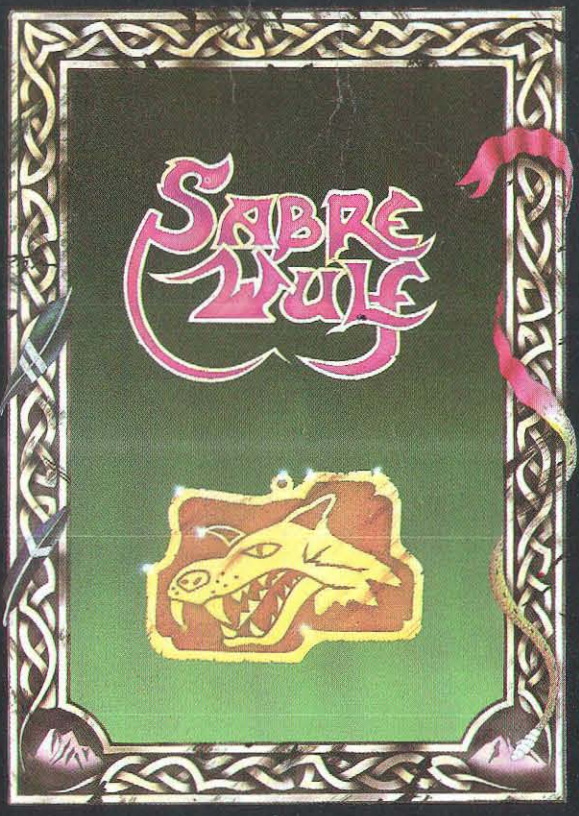
Mouse Matters:
AMX Utilities, AMX Desk, Watford's Colour Art

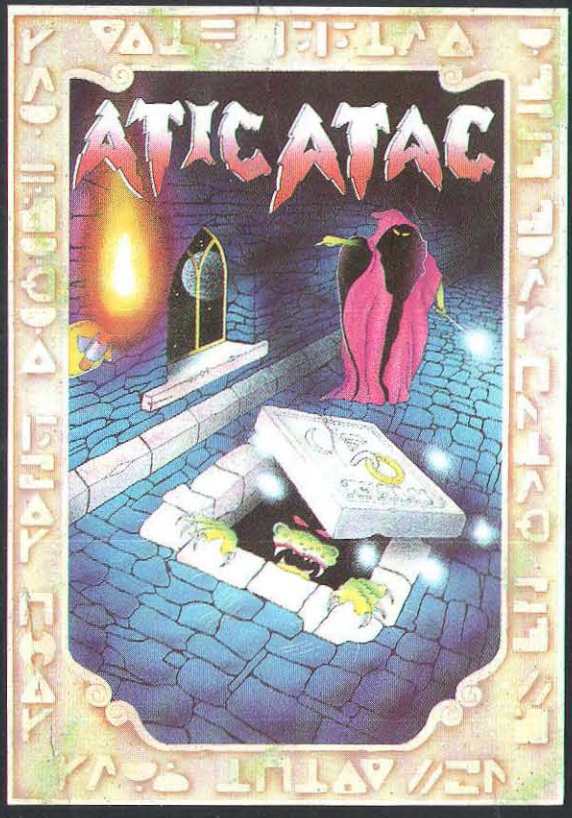
Viewstore joins the family

ULTIMATE
PLAY THE GAME

BBC MODEL B 1·2 OS







"ALIEN 8", "KNIGHTLORE" & "SABRE WULF" recommended retail price £9.95 inc VAT.
"ATIC ATAC" recommended retail price £7.95 inc VAT.
Available from W.H.SMITHS, BOOTS, J.MENZIES, WOOLWORTHS
and all good software retail outlets. Also available from
ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU
(P&P are included) Tel: 0530 411485

16k EPROM

***HEX,** Is a full HEX dump, displaying 8 bytes of HEX and ASCII equivalent per line. A status line shows the current address and the byte at this address in:- HEX, ASCII, Decimal and either the binary, basic token or assembler mnemonic. Forward and reverse scrolling of the display at normal and high speeds is a feature, as is a full on screen memory editing facility which allows inputs in either hexadecimal, ASCII characters or assembler mnemonics.

***MON,** Serves the same function as *HEX, but the display is in disassembled opcodes, rather than *HEX. The editing and scrolling facilties are the same as for *HEX. An additional feature of *MON is the ability to directly follow JSR's, branch's etc.

***DEBUG,** A full featured program debugging aid, allowing the programmer to see the most intimate details of the program under examination. Features, variable speed, single stepping, breakpoints, continuously updated disassembler, selective HEX dumps (up to 6) plus current stack, all continuously displayed on screen, plus many other features.

***DISCED,** A comprehensive disc sector editor enabling any sector of a disc to be read, inspected, edited and written back. It will work with any 40, 80 or dual formatted single density disc.

***DGET,** Searches a disc for all occurances of a string or group of bytes.

***REL,** Enables machine code to be easily moved around in memory, automatically adjusting JSR's, JMP's etc.

***SLOW,** This command causes the entire computer to slow down to any variable speed between 1 and 255. This can allow the in depth study of graphic's methods etc.

***EDIT,** A dynamic basic screen editor, cursor controlled with full forward/reverse scrolling of listing, incorporating insert/delete lines, insert/overwrite characters, enter line from any position after editing.

"No need to Sweat! Let me be your slave."

***REF,** Produces a cross-reference listing of the current basic program. All variable names are listed (WITHOUT HAVING TO RUN THE PROGRAM!) in alphabetical order followed by the line numbers on which they are referenced. Numeric items can also be crossed referenced if desired.

***SORT,** A built in sort routine allowing any single dimension array, be it integer, real or string, to be sorted.

BASIC COMMAND LIST:-
*PROG, *BAD, *EXTEND, *PACK, *SORT, *PAGE, *ENVELOPE, *FIND, *REPLACE, *XREF, *TRON, *TROFF, *CHAR, *EDIT, *EDKEY.

MACHINE CODE COMMAND LIST:-
*MCODE, *MOVE, *CROM, *SLOW, *GET, *PHEX, *GO, *MON, *HEX, *SPACE, *DGET, *DISCED, *DIS, *DEBUG, *CRC, *REL.

Designed with the serious programmer in mind, a 16K Eprom packed with a multitude of programmer friendly utilities, as with all SLAVE'S, SLAVE is instantly available and will obey an extensive range of commands. So why not invest in more muscle for your BEEB, and get some help with the heavy work!!! SLAVE has over 30 comprehensive machine code and basic tools.

"The Slave Drivers Guide."

**A&F Software Ltd.,
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Woodbine St East,
Rochdale OL16 5LB**

**24 hrs HOTLINE
0706 341111**

Slave is available direct from A&F Software Ltd for only £39 95
This includes post, packing, VAT, and User Guide.

Please send me a Slave, I enclose my cheque/PO for £39 95

Cheque N°. _____ Please debit my Access/Visa N°. _____

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Unit 8, Canal Side Ind. Est.,
Woodbine St East,
Rochdale OL16 5LB**

Please allow 14 days for delivery.

A&

Volume Two Number

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REGULARS

A&B Computing is constantly on the look-out for well-written articles and programs for publication. If you feel that your efforts meet our standards, please feel free to submit your work to us for consideration for publication.

All submitted material should be printed or typed, double spaced. Any programs submitted should be listed (55 character width emphasised if possible). A cassette of the program alone will not be considered. All programs must come complete with a full explanation of the operation, and where relevant, the structure. We also require the program in machine readable form (cassette, 40 track 5¼", or 3" disc) plus any suitable screen photographs, printer dumps and so on.

All submissions will be acknowledged and the copyright in such works which will pass to Argus Specialist Publications Limited will be paid for at competitive rates. All work for consideration should be sent to the Editor at our Golden Square address.

FEATURES

A&B

Eight August 1985

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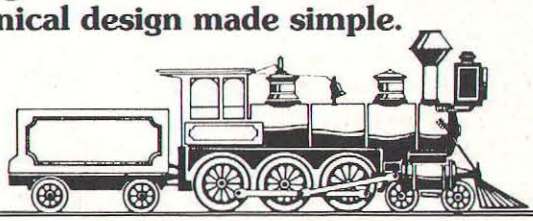
SOFTWARE



Next Month

Get it right! Exorcise program typing errors with A&B's own program verifier that checks your typing – line by line!

Microcomputers in photography – special feature that shows you how.

Ally Pally – make an exhibition of yourself with our original adventure game.

Beebug's MUROM – for music while you work?

Jon Vogler on mail merging.

More eventing with Alan Rowley.

More bite to your BBC – the Watford RAM board reviewed.

Plus: Random Access, Feedback, Making the Most of..., the latest soft and hardware reviews and more.

September issue of A&B Computing – on sale 2nd August.

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News Ne

TRIPLE-D FROM GEMINI

New from Gemini Marketing is Triple-D — a suite of software that offers "total integration" and full "datafile compatibility" between database, spreadsheet and graphics business packages.

Designed for businessmen, educationalists and the home user, you will have the capability of storing records and database information, compiling a spreadsheet and then plotting it on a graph plotting utility, or turning your sales figures into pie charts.

The software package comes complete on disc, with manual and utilities, there are even utilities to help Gemini's Datagem database users. The whole software package costs £65.95, although DDD Base, DDD Calc and DDD Plot can be bought separately at £29.95 for each individual module. So confident are they of Triple-D's quality, Gemini are offering a no quibble, money back guarantee if the consumer is not completely satisfied.

Gemini Marketing Ltd, 18a Littleham Road, Exmouth, Devon (0395) 265165

SOCIAL CLIMBING

If you're bored with the run-of-the-mill "You are in a damp and gloomy cavern" adventure games, why not try your hand at Hampstead, a rather different adventure from Hobbit makers, Melbourne House. With not a dragon or magic potion in sight, your task is the "fiendishly difficult quest for the elusive attributes of worldly success". But how to go about it? Forget being Mr/Ms Nice Guy. Your aim is to claw your way upwards from your cramped and dingy bedsit in a forgotten corner of London via grubby railway carriages, hamburger restaurants and betting shops, to attain 'Hampstead' and the giddy heights of company boardrooms and trendy Covent Garden wine bars. Forget hard work — the trick is to read the right papers, wear the right clothes and be seen in the right places.

Newly converted for the BBC, Hampstead was chosen as game of the year by the Listener magazine. At £9.95 for a Quill-generated text-only adventure, Hampstead is not cheap, but it's witty and original and who knows — you might meet Justin Perrier, Lord 'Chubby' Fish, Sir Lionel Thrum and enter a whole new social circle.

BBC and Electron versions available from most computer stockists. *Melbourne House 01 940 6064.*

BUDGET PLOTTER

A high speed four colour printer/plotter for £399? New from Bizzell Computers is a printer/plotter that prints vertically or horizontally in text and in four directions in graphics for just that sum.

Designed to be suitable for high speedCAD output, the printer/plotter includes both parallel and RS232C interfaces are included, all command codes and parameters are in BBC BASIC, the pen colours are red, green, blue and black, and is supplied with a manual. It can be used in conjunction with a micro for graphs, drawing symbols, axes, geometric patterns, charts, diagrams, circuits, computer art, and flowcharts.

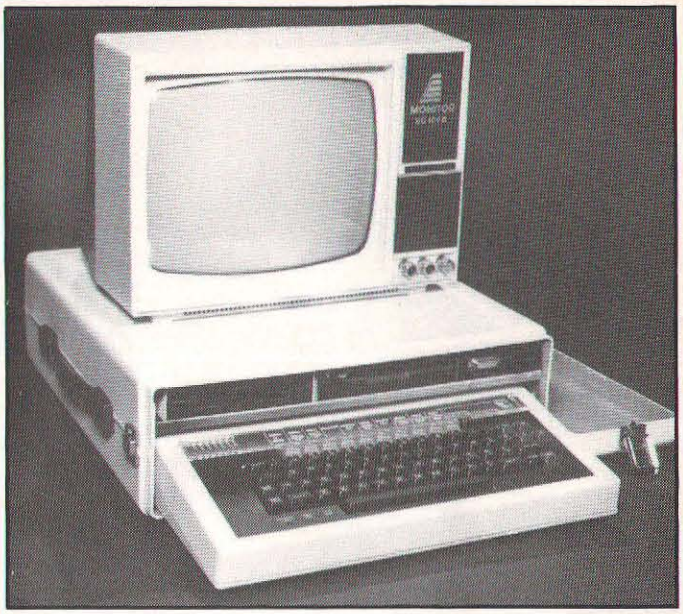
Bizzel computers are at Walnut Tree House, Forncett St Peter, Norwich. (095) 389 592.

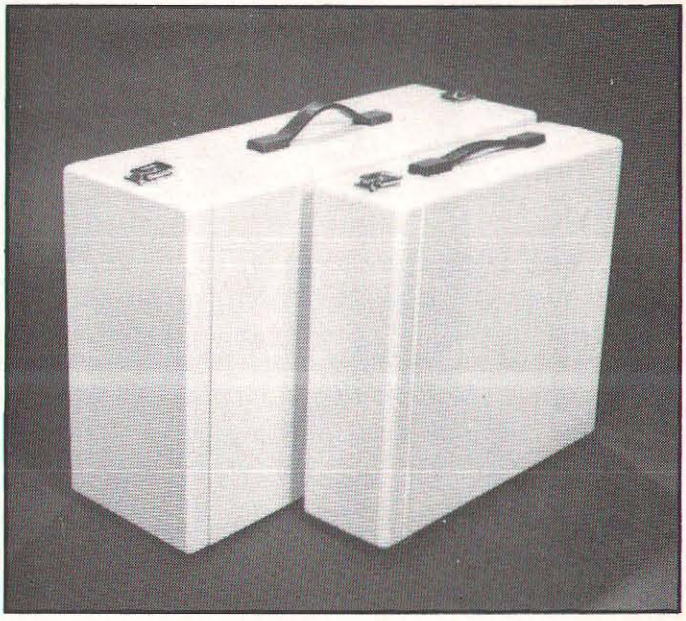
NETWORKING SOLUTIONS

Northern Computers Ltd have brought out Supervisor, a new machine code ROM for the BBC Micro and Econet network for £99. The file serving software is based on ROM instead of the Disc system and the manufacturers claim that is is the fastest network file server available on the BBC.

It supports all of the BBC BASIC file handling facilities, and full length files which were not available on the old level one file server and the new level two software doesn't need a second processor and will operate in ordinary BBC DFS format.

Northern Computers Ltd, The Bond, Godstall Lane, Chester (0928) 35700.





Now you see it...now you don't

WALKABOUT

Now you and your Beeb need never be parted. You can take it to the office, the worksite, on holiday, away for the weekend in fact anywhere in the world in two strong carry cases from Raceamble Ltd.

Available in two sizes, the smallest costs £60.00 and will hold a BBC micro and two Disc Drives, the larger case at £80 can manage all that the smaller model can, as well as a printer sized peripheral and a small micro monitor and a socket for the analogue port is also included.

Raceamble Ltd, 44 Fore Street, Ilfracombe, North Devon (0271) 62801

ws News

NEW LANGUAGE IN COMAL

One of the latest releases from the Acornsoft stable is COMAL — a language that's very popular on the continent. It has been chosen as the official language for secondary school computing in Ireland, Denmark and Sweden, is approved for use in Scotland and is currently attracting a great deal of attention in the USA.

COMAL offers all of the structuring that a modern computer language needs and can check for syntax errors as program lines are entered. It promotes good programming practice and is is a full and standard implementation.

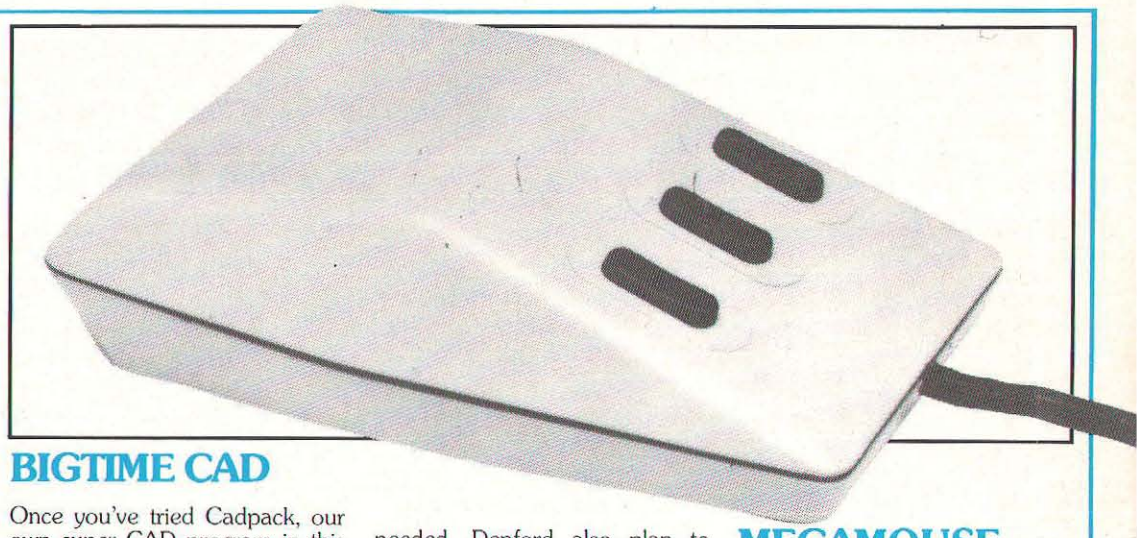
Available from most computer shops, COMAL for the BBC micro comes on a 16K ROM and the price tag of £49.85 includes a 440 page manual. An Electron version is being planned.

ADMINISTRATORS FRIEND

A new package from Educational Administration Software could ease the burden of keeping school records, timetable and exam entries. The package has already been successfully tested and used in schools and colleges around the country.

The suite of programs, which is tailored to individual school's needs, is written in a way that requires a mininum response by the user. When all of the data is in the machine, print outs (on an Epson printer) are made. The time table is able to cope with a maximum of 400 pupils a year, divided into a maximum of seven year groups (includes lower and upper sixth form). There are a maximum number of 16 tutor groups and a maximum number of 120 teachers, with 2/3/4 character class names. The whole package is integrated so that the information between programs is readily readable.

The software costs £90 and is available from Educational Administration Software, Somerville House, Brunswick Road, Withington, Manchester, M20 9GA (061) 445 1379



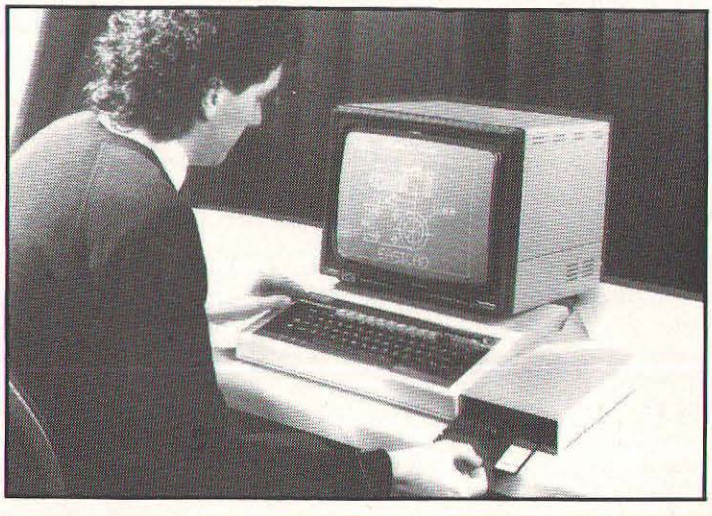
BIGTIME CAD

Once you've tried Cadpack, our own super CAD program in this issue, perhaps you'll be inspired to move on to bigger and better things. Two new BBC compatible "professional" CAD packages have recently been brought to our attention: Easicad, from Denford Machine Tools and the Conect/Sharp CAD/CAM system, to work with the Conect 121 CNC Lathe.

Easicad is a 2D draughting package designed to produce most of the facilities of large CAD systems at a price that will put in within the budgets of schools and colleges, £495. Amongst others, the package incorporatesfeatures such as Move, Circles, Screen Dump, Where Am I?, Dimension, Zoom, Grid, Co-ordinate Input and Fillet, and all the features are attainable with just the software and the BBC, no extra hardware is needed. Denford also plan to release a computer aided manufacture (CAM) module.

With the CAD/CAM system from Shesto Tech Ltd, the user can design a job on screen using mouse controlled software which can then be output to a flat bed plotter to produce British Standard drawings, be run as a simulation on screen or be compiled into coordinates and G-codes to drive the machine tool. The information is downloaded via the RS232 port into the BBC which controls the lathe.

Easicad: Denford Machine Tools Ltd, Brighouse, West Yorkshire (0484) 712264Conect 121 system: Shesto Tech Ltd, Unit 2, Sapcote Trading Centre, 374 High Road, Willesden, London, NW10 2DH. 01 451 6188.



MEGAMOUSE

Just too late to be included in our Mighty Mouse article, Wigmore (manufacturers of the Trackball) brought to our attention that they had just released an all British mouse on to the market — the Megamouse. (Many more rodents and we'll have to call in the Pied Piper!)

As with the AMX mouse, the Megamouse plugs into the Beeb's user port.The main difference is the rubber coated ball for smooth surfaces, and it uses light rather than friction to sense where it is. The resolution is 100 points per inch.

Available with the Megamouse are Mousepaint and CADmouse. Mousepaint operates in mode 1 and functions include rubber banding, painting with variable brush sizes, save, load and print. Options, as usual, are selected from icon symbols. CADpack is designed for artists and serious CAD users and uses mode 0 for high resolution or mode 1 for real time colours. Commands include dimension lines, centre lines and corrected lines operating to isometric angles.

The Megamouse with Mousepaint costs £86.94; with CADmouse £103.73 and with both packages, £114.54. Watch future issues for a full review.

Wigmore House Ltd, 32 Saville Row, London W1X 1AG 01-734 0173

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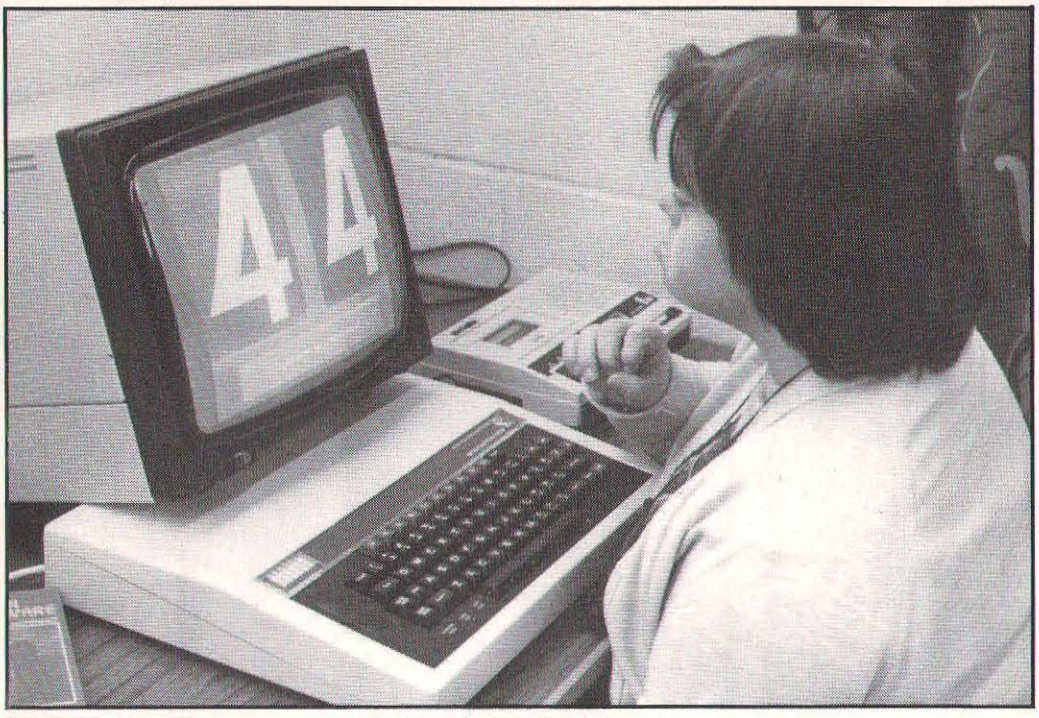


Nordis Software in use at an Adult Training Centre in Northants.

SELF-HELP SOFTWARE

If the boom in microcomputers has proved one thing, it's that necessity is certainly the mother of invention. On finding that there is no commercial software available that meets their needs, many users in specialist areas have been prompted to write their own programs. This is just the case with Nordis Software.

Neville Marston and Tansy Mabbott, two Northants psychologists, found that nearly all educational software stared at too high a level and progressed too quickly for slow learners. Pupils who have learning difficulties need to progress at their own rate and need consistent and repetitive teaching. Computers, then, are an ideal medium for slow learners. Repetition is easy to achieve and the computer's sound and colour facilities, and the need for pupil response can make learning much more interesting.

Two years success in Northants and demand for such software from special schools and centres for the mentally handicapped throughout the country has led to the formation of Nordis Software. All the programming is done by five physically programmers and there are currently 60 programs available on six discs/cassettes for the BBC micro dealing with pre-reading, number recognition and simple addition and telling the time. The pre-reading programs require a light pen and a Concept Keyboard and the number programs need a light pen and use the voice chip where fitted. Each disc or cassette costs £15 and contains approximately 10 programs.

Nordis Industries, Cornhill Close, Lodge Farm Estate, Hopping Hill, Northampton NN5 7UB. Further details from Neville Marston/Tansy Mabbott on (0604) 34833 ext 5525

ESTIMATING MADE EASY

Are you a plumber, electrician, carpenter, heating engineer, builder, glazier, motor mechanic, potter or painter? If so, you may well be interested in a new estimating package, price £19.95, for the BBC B from the Micro Component Trading Company.

The minimum configuration needed to run the program is a 40 track dual single sided disc system: a dot matrix printer is not a necessity, but MCT estimate (!) that *with* a printer, the user would save more than 75% of his time, thus saving time and money.

Further details from Micro Component Trading Company, Group House, Fishers Lane, Norwich, Norfolk NR2 1ET (0603) 633005.

MISSING LISTING

The more discerning amongst you might notice that there is no software listing at the back of the issue this month. This is because we're giving it an overhaul – a complete recheck and update.

If *your* software isn't in the present listing, send us the details and we'll endeavour to include it in the all new updated version – in an A&B near you soon!

SCHOOLS GET INTO BUSINESS

Schools and trading departments can now teach in a practical way how micros are used in the world of commerce with Acornsoft's latest software package for schools and colleges.

Micros in Business, is a suite of programs developed with the DTI that includes word processing, database management, financial modelling and personnel record keeping and diary management. The package is said to give an insight into the way a modern office works and will suit business studies courses and training departments in industry.

In order to make the software as realistic as possible, many of the programs are based on Acornsoft's larger, professional packages such as View and Viewsheet.

Available from educational dealers or mail order from Vector Marketing Ltd, London Road, Wellingborough, Northants. More information from Acornsoft on (0223) 316039

NETWORKING NEWS

Two years development at Winchester College has resulted in the release of Winnet, a new network for the BBC micro. Unlike other systems, but Winnet is not based on the Econet system and can link up to 16 BBC computers andfour Serial or Parallel printers to provide shared disc and printer accesses by any member of the network.

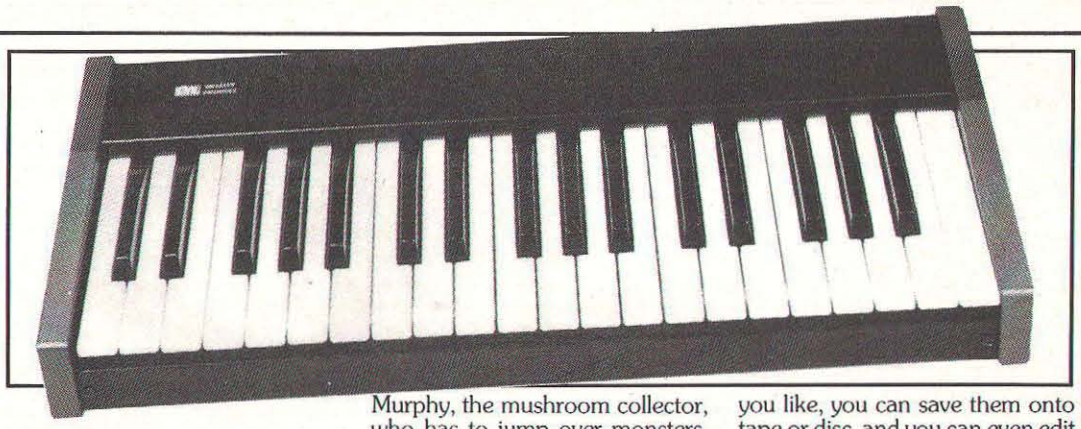
There is no memory loss from using memory-greedy networking software, all of the BBC commands supported and there are extra commands for communicating between each station. Winnet is also compatible with View, Wordwise and other ROMs.

A multiplexor unit and master software will cost £250.00 with each station setat £25.00 (excluding VAT) – that's about £450 for an eight station network (not including BBCs, of course).

Further details from Dr J R Havil, Winchester College, Winchester, Hants (0962) 64173

ws News

MUSICAL ROM



Manufacturers of the Echo Music System, LVL, have upgraded their Echo software, originally on disc, and developed a ROM in conjunction with their three octave keyboard. The new ROM will allow the player to select various instrument sounds from a library of built in and user defined sounds stored in the machine, and play them using the BBC's built in sound chip.

The Echo ROM will also allow music to be "recorded" in the BBC and played back and is generally faster than the older disc version. The price of £29.95 includes a manual and integral programming language. The ROM and keyboard are available separately.

LVL, Electron House, Bridge Street, Sandiacre, Notts (0602) 394000

MAGIC MUSHROOMS AT ACORN?

No, it's nothing illegal, Magic Mushrooms, is one of the latest Acornsoft supergames. You are Murphy, the mushroom collector, who has to jump over monsters, climb ladders, avoid falling through quicksand and generally stay in one piece. So far so good, but what's new?

What makes Magic Mushrooms different is that you can actually set up your own screen, with as many (or little) hazards and walkways as you like, you can save them onto tape or disc, and you can even edit the screens supplied with the game. Watch the software review pages for our comments.

Magic Mushrooms is available for the Electron (cassette) at £11.95 and the BBC (cassette) £12.95 and £14.95 (disc) from most stockists.

IN BRIEF...

The Timetabler from Firstred can timetable a 2000 pupil school using 100 teacher records as well as control a cycle of 80 periods. The program supplied on disc is also Epson compatible and requires a basic 100K disc drive as minimum. Available from Firstred Ltd, Suite 7, Wolseley House, Wolseley Terrace, Oriel Road, Cheletenham, Gloustershire.

Always mislaying /spilling coffee over your discs? Keep them in a safe place and free from dust and grime in one of the new disc storage units from 3M. Boxes come in all shapes and sizes to store from 10 to 50 3.5" or 5.25" discs. You'll find them in all computer stationers.

The Remedian Tidybase is a new idea which can store monitor, discs and Beeb all in one housing and hide the cables out of the way. The Tidybase also acts as a secure clamp, making it more difficult for equipment to be stolen. Other modules are available for second processors, modems and all sorts of add ons. Phone Remedian on (0202) 708404 for more details.

Education cuts are no laughing matter, but Acornsoft have made some to be applauded. Schools and parents who buy five Acornsoft/ASK software packages will save over 50% on current list prices, and purchases of less than five will save 30%. The offer applies to all Acornsoft/ASK titles for the BBC/Electron except Podd.

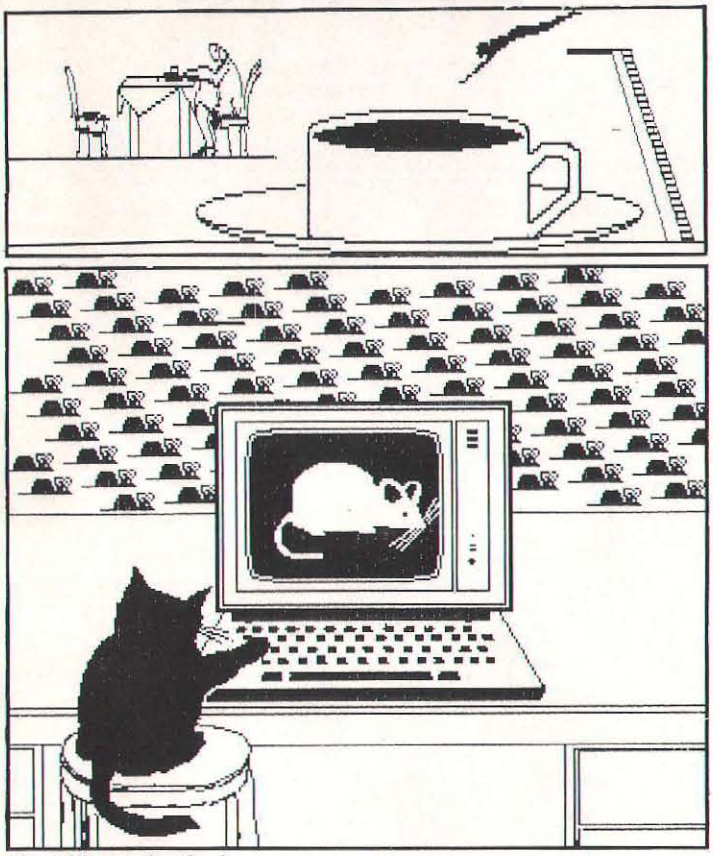
Micro English is a "Full O Level English Language course" for the BBC and Electron which features a talking computer facility via an accompanying audio cassette. The tape, which is synchronised to within 1/100th of a second, makes an interactive lesson on both computer and tape machine possible.Suitable for eight years upwards and students learning English as a foreign language. Telephone (0784) 58771 for more details.

The 6502 development system from Acornsoft for the 6502 second processor is now available after bugs were found prior to its release (as reviewed in January's A&B). The system comprises a full editor and Macro assembler with print and trace utilities. The package has a function key strip, a 40/80 track disc, reference card and a manual.

The Art of Abbas

Mark Webb

Computer graphics design. How it's done



Book illustration for Longmans

Hope you spotted the A&B logo on the front cover this month. We are proud to say that it, and our Summer cyclist, were generated on a BBC Microcomputer. Of course computer graphics designer Abbas had to provide the human touch. and Prisma II provided a few more pixels than is normal.

Abbas has been producing computer graphic designs since 1982 when his first effort for a Cambridge Theatre programme was produced on a cassette based BBC system. The BBC Micro is now the heart of a specialised system built to produce computer graphics for hardcopy (A&B's cover) or for animated demonstration (a computer kid eating a Wall's Megabyte lolly!).

The most important piece of equipment is the Summagraphics Bitpad I. This is a precise instrument which, in combination with purpose written software, can be used to build images pixel by pixel. It's much easier to use than the bitstik for instance and is not confined to a particular Mode.

The software, by Richard Josefkowski, started out as crude guesswork of what would work but has developed by trial and error into a sophisticated set of line drawing and paintbox routines which can operate in all graphic Modes, and Mode 7.

Initially pictures were often built up with large BASIC programs incorporating PLOT and DRAW and lots of SIN and COS. The exploitation of floppy disc storage is now crucial since the painstakingly digitised backgrounds can be quickly loaded into memory and then animation incorporated into the screens if necessary. To this end Abbas has taught himself to program in BASIC, had become very familiar with the VDU19 statement and a bit fed up with the lack of memory offered by the standard BBC (now partially overcome with a 6502 second processor).

ANIMATION ARAB STYLE

The combined digitising and animation technique has been used on a whole range of projects. A particularly fascinating demonstration was commisioned by Acorn to show off the BBC and its Arabic character set to potential customers in the Middle East.

The religious motif built up in the first screen and the local patterns and architecture reveal the considerable work which goes into getting the appropriate content. The animation includes a flying carpet viewed against a starry sky.

A colleague, David Summerville, provides the music which sometimes accompanies the demos. In this case, it is recognisably of Arabic origin to complete the effect.

Perhaps the most awe-inspiring of Abbas' work to date is the Mode 7 animation he put together for Acorn's Silverstone race day last year.

Over 300 screens are loaded into memory store and moved in succession into screen memory to create a very bold, comic strip animation. A zoom routine is used to stunning effect. Anyone who sees the demonstration is sure to go away with a completely different outlook on humble Mode 7 block graphics.

HARD COPY

Abbas first contemplated the use of computer graphics as an alternative tool for line drawings, a "clean" method of producing ink illustrations.

Here too, he has refined the process considerably and his work has been used in a variety of publications, not all of which are computer related.

Abbas has used his own software and commercial tools like Picture Maker to produce Christmas cards for Acorn, book covers for Heinemann, Longman educational manuals (for French Apple software), and the German manuals for Acornsoft's Creative Graphics.

A continuing project is in association with Q publications, who produce puzzle books. Another animated demonstration has been helping sell puzzle books to travellers at Luton airport and moves into Heathrow this year. Point of sale computer graphics advertising relies on the computer artist to make the displays attracive. In this case the design reproduces the style of an adventure or crime strip cartoon.

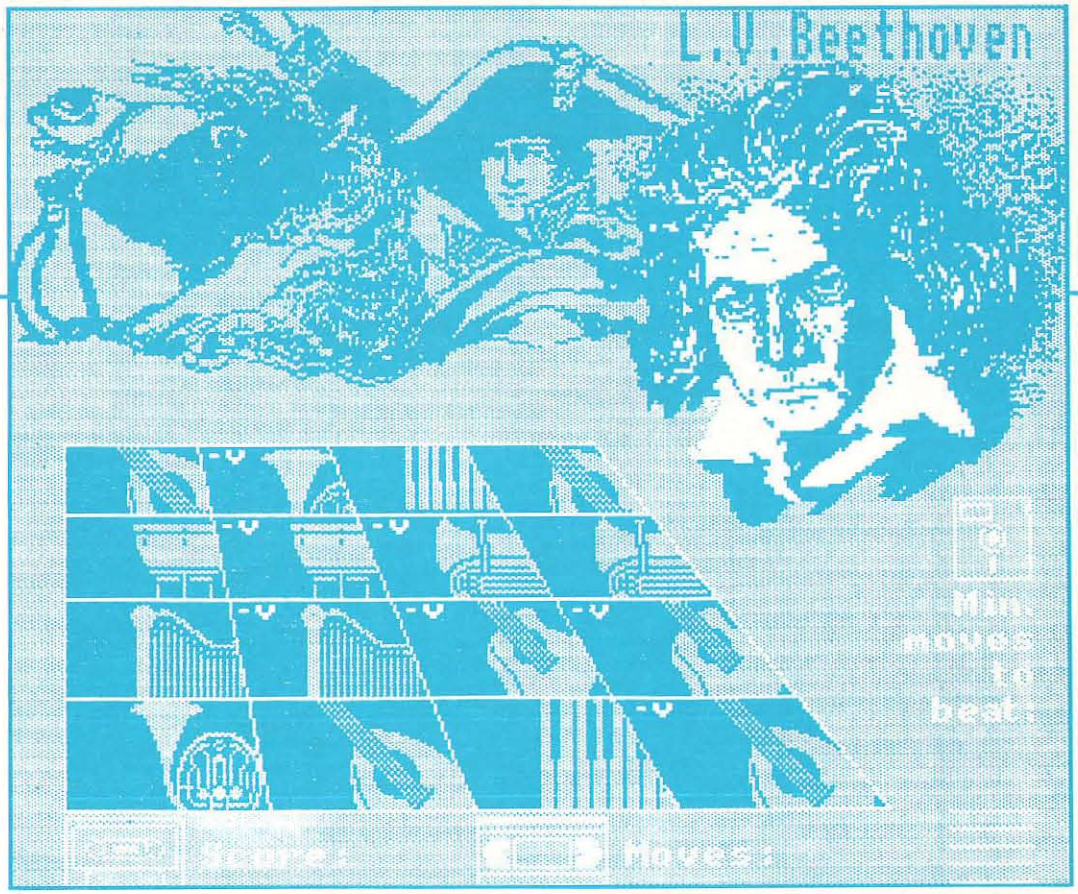
When it comes to reproducing screen graphics, photography plays an important part. Abbas has polished the art of the screen shot through much trial and error and purchasing of expensive photographic equipment! (See next month for a feature on photography and BBC screen graphics).

Abbas has even been writing his own games, this time for the Acorn/Leeds Permanent Building Society promotion seen last Summer. Children were encouraged to complete the games and to win some cash to open a new account with. For future applications Abbas' brilliant pound note graphic will have to be redone in coin form!

Also for Germany are the finely detailed portraits of famous figures which are incorporated into a logic game designed for BASF. And do you recall the Electron television advert last Christmas, the one with the Michaelangelo on the screen? Yes, the work of Abbas, this time for Aspect, Acorn's advertising agency.

TECHNIQUE/ TECHNOLOGY

When Abbas used up his savings to invest in the BBC Microcomputer equipment he needed three years ago, he couldn't have realised that the step up from cassette to disc would one day be followed by a move to hard disc.



Promotional game for BASF, Germany, commissioned by Acorn International

That is what he now has to contemplate and the software to incorporate a Torch 20 Mbyte hard disc into his system is being written. This extra storage is made necessary by the Prisma II which his old colleague Richard Josekowski has built. The software to make use of the new high resolution graphics extension makes good use of VDU19 so should be familiar territory! The high definition and ability to mix colours for precise shading is combined with facility to animate through switching the palette or different screens. Abbas can now consider the move into video, a natural home for his work.

The latest project is a sign of things to come, a graphic demonstration of a Schlumberger (oil drilling experts) drill bit at work. The clean lines of the machinery contrast with the mud being flung away from the drill head.

Abbas is currently using a prototype PRISMA II with 256K bytes display memory. The BBC control ROM allows him to use BBC BASIC commands such as GCOL, PLOT, MOVE, DRAW and VDU. There are also several extension to the PLOT commands and new operating system commands like *ZOOM and *GENLOCK. The latter is all important for the link with video. A digital frame lock circuit sycnchronises the display and video frame. Abbas can make use of 16 solid colours, from a choice of 4096. In practice, 16 colours are quite enough for the designer. The precise red, green, blue content of any colour can be "mixed" for subtle shading and stippling effects.

PRISMA II supplies *ZOOM, *LEFT, RIGHT, UP, DOWN and CENTRE for smooth panning pixel by pixel. It's amazing to see apparently solid colour break up into individual pixels as you zoom onto some detail. By splitting the screen into four or sixteen, rapid redrawing with the *OVERLAY command creates smooth animation. This is the technique used for Abbas' drill bit. If you wish you can split the screen up into 48 equivalents of a Mode 2 screen. The VDU19 and *PALETTE commands can also be used for colour switching animation.

The additional hardware removes the restrictions of the BBC while holding on to the contolling software, no new language to learn, just PLOT and VDU like before.

Abbas and his microcomputer graphics have come a long way since that first cassette full of digitised screen. And his latest work: the front panel of Acornsoft's new game Revs!

PRISMA II

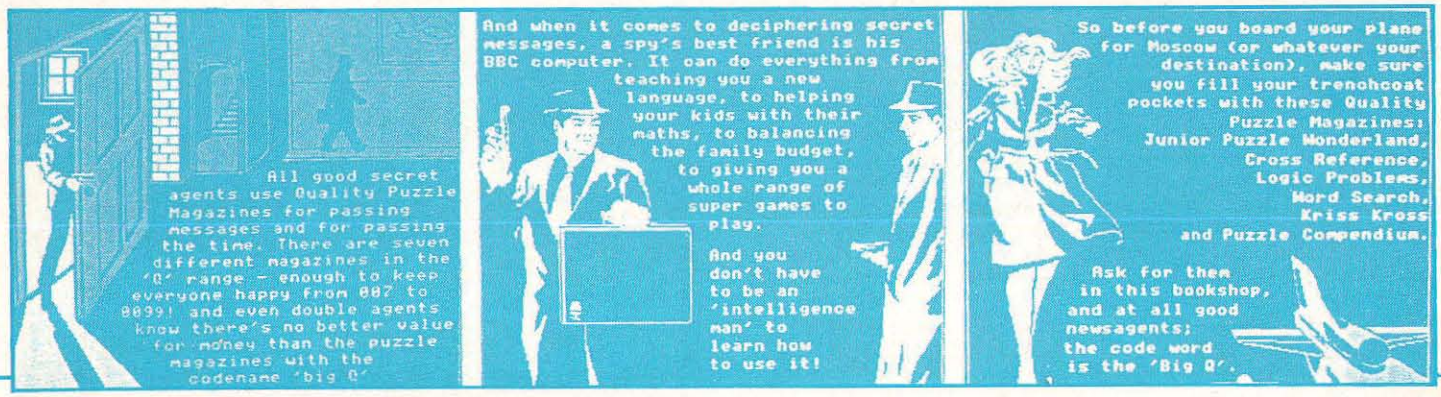
When we talk about the graphics screen co-ordinates of the BBC Micro, we are referring normally to a *theoretical* resolution of 1276 by 1023. The PRISMA II Colour Graphics Extension Unit can remove the "theoretical" and replace it with a Mbyte of screen memory controlled by the latest Hitachi 63484 graphics chip — 2 million pixels to play with!

The PRISMA II connects to the 1Mhz bus and you can "daisy chain" a hard disc onto it if required. The resolution is 832 by 575 pixels on a 50 Mhz interlaced monitor and there's a 1Mbyte option. The Hitachi chip can handle fast line, arc, circle, rectangle and character drawing. These functions, zoom and pan are all implemented in hardware although called simply through operating system and VDU commands.

The Hitachi HD63484 runs at 8Mhz with an internal 32 bit wide data bus. Four bits are required for one pixel definition. The BBC accesses the linearly drawn screen sequentially for storing and retrieving screen memory. You can imagine why Abbas is going to need a hard disc.

PRISMA II is quickly going to realise its potential in the creation of video titles and effects. The sprite type animation feature implemented in hardware means that real-time animation saves expensive and time consuming video edits. It has to be seen to be believed!

Further information about the PRISMA II Graphics Extension Unit can be obtained from Richard Josefkowski, Millipede Electronic Graphics, tel. 0223 862066.



Promotional work for Q Puzzle Magazines

Rollerballs

Trevor Attewell

Test runs with trackballs from Marconi and Wigmore

In this review we shall be looking at two types of rollerball. Readers will be familiar with these devices, in which a sphere can be rotated by the fingers or palm of a hand to act as a substitute for a conventional joystick. Joysticks normally plug into the analogue port, as do some rollerballs. The equally familiar "mice" normally work through the user port, as do some rollerballs – after all, a rollerball is effectively a mouse turned upside down!

All kinds of joysticks, rollerballs and mice have one or more push buttons to act as 'fire' buttons, or to replace specified keys on the normal keyboard. Obviously the software used with any of these gadgets must cater for the appropriate input port.

Of the two rollerballs under review, the first is sold by Wigmore House Ltd. of Savile Row. Called Trackball, it uses the analogue port. It is sold without software as a joystick substitute. Wigmore also make a mouse, called Megamouse, which runs from the User Port, and we hope to review this shortly as a separate item. For sketching and CAD purposes both can use the same piece of software called Mousepaint, which comes as part of the Megamouse package, and is available separately for Trackball. To be able to work with either product, Mousepaint can switch between the ports as required. Trackball costs the very modest sum of £24.90 including VAT. The Mousepaint software costs £9.89 on cassette or £11.50 on disc (or comes free with Megamouse).

Wigmore's Trackball is a plastic box, 155 mm square x 65 mm high, with chamfered corners and four non-slip plastic feet. The 57 mm diameter ball is supported at three points – two are plastic friction rollers on shafts which are geared up to drive the two potentiometers, and the third is a small steel bearing. There are two red buttons (top left and right), but they are simply connected in parallel. The cable to the analogue port is a decent 1.28 m long. Although the device looks a trifle clumsy, it has the advantage that it sits easily on one's lap, and is very stable on any flat surface. It has a robust feel, and you'd have to try hard to damage the end-stops on the potentiometers. The action is smooth considering the inevitable friction in the potentiometers.

JAM, TOO

Wigmore offer Mousepaint as an inexpensive "bread-and-butter" piece of software. However it is very effective, and sophisticated for its price. It works in Mode 1, giving four colours at any one time, selectable from eight. The program is icon-driven, very easy to use, and provides for saving and loading your masterpieces. They can also be dumped to a printer – the machine-code dump is suitable for all Epson or Epson-compatible printers.

Some options require the use of the function keys. f0 is a toggle to remove or replace the icon grid, which is useful if you want to photograph the screen. f1 starts a printer dump, after asking for confirmation. f2 and f3 give soft or loud noises whenever any action occurs. (A sound is a useful acknowledgement that an instruction has been recognised). f4 toggles between the Analogue port (as default) and the User Port (see above). f5 to f8 inclusive are all colour toggles, respectively blue/black, red/magenta, green/cyan and yellow/white.

The icons are largely self-explanatory, and are divided into 'commands' and 'drawing options'. The former are indicated by letters, including (L)oad, (S)ave, (C)lear – which calls for confirmation before clearing the complete drawing area – (P)aper, (F)ill and (O)utline. (P)aper is used to set the background colour. (F) is used with appropriate drawing options to produce ready-filled enclosed figures, while (O) produces the required outine unfilled.

The drawing options include solid and hatched filling of an already outlined space, which can only be used over the background colour. A paint brush is available, and the brush width is variable over a wide range. Apart from its normal function this is also useful for deleting errors by painting them out with background colour. Circles and elipses can be drawn by defining the centre point and either the radius or the horizontal and vertical semi-axes respectively. Rubber lines and rectangles are provided, and the latter may be solid or dotted. Corrected lines can be selected, in which case any line drawn at an angle to a previous one will be set automatically at right angles to it (provided the angle between them was originally more than 45 degrees). Text can be placed anywhere on the screen, though only one size is available. The default drawing mode is 'stream line', in which the cursor leaves a trail in the currently selected colour as long as the button is held down.

As stated above, a standard printer dump is included, and this prints in inverse shading, so that a black background prints white and so on (some authorities are now perversely calling this a 'normal' dump, which is guaranteed to confuse everyone!). If you prefer an alternative dump which is available in a ROM, from Printmaster for example, then try the following (unofficial) modification:
From within Mousepaint (*before* drawing anything!) press BREAK and type OLD ‹RETURN›, followed by:

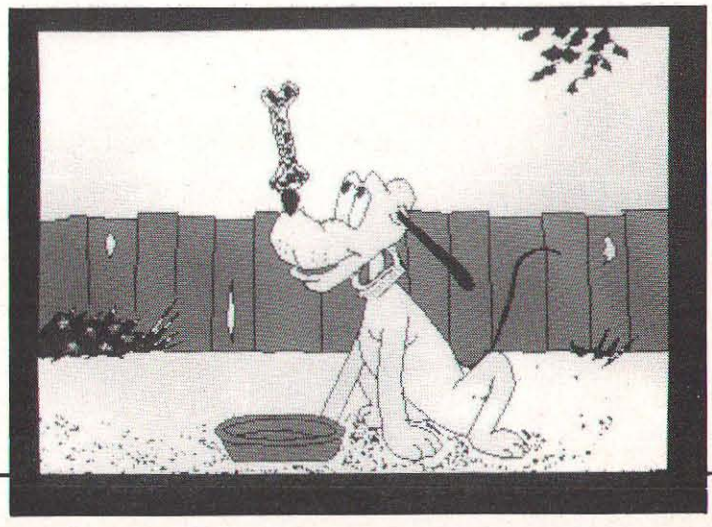
3511PROCNM:PROCDC:CALL&934:*COMMAND ‹RETURN›

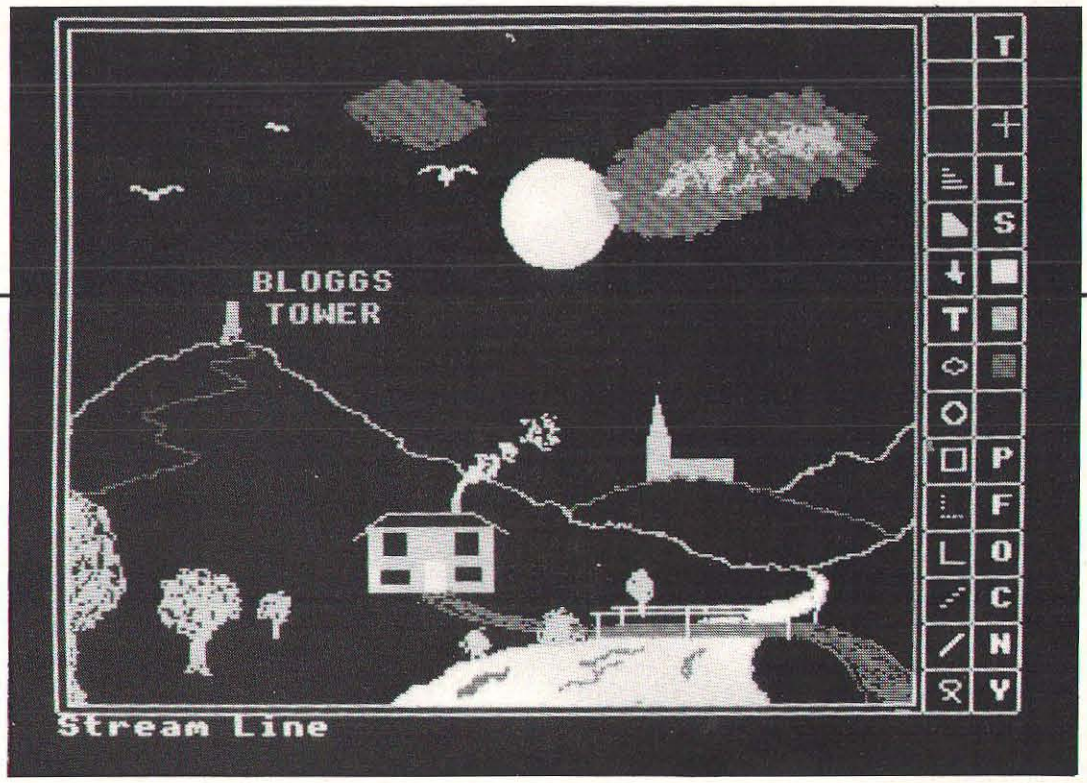
Where *COMMAND is the ROM command you want to use. This works perfectly well on the current version, but naturally there is no guarantee that it will do so on all future ones.

POT BROWN

Marconi's RB2 Tracker Ball is connected through the user port. It is a redesigned, scaled-down version of a professional device used in avionics, and comprises a wedge-shaped plastic box with a flat rectangular top sloping down towards the user. The 57 mm diameter brown ball drives two stainless steel shafts, each supported on two ball bearings, one end of each shaft carrying a thin phosphor-bronze wheel about 33 mm in diameter, with 44 radial slots near its outer edge. These slots run in the gap between a LED and a photoelectric sensor, forming an optical shaft encoder. A third ball-bearing completes the ball support. Two pulse trains are derived for each axis of rotation, and are used to determine the direction as well as the extent of any motion. There is no "zero" position, so neither the initial ball position nor any slippage are important – pulses are simply counted up or down whenever movement occurs.

The three buttons, placed at the top, can be assigned by the user or by any software intended for use with the RB2. The RB2 is very





smooth in use, needing little pressure to turn it, so precise movements are easily made.

Two packages are available, both containing the same rollerball. The first (priced at £59.50 inclusive) includes a simple demonstation drawing program called "Paintball", some utilities and a manual. These programs are on cassette, transferable to disc. In addition there is a software drawing package on disc called "Microdraw", produced by Micro-Draw Ltd., with its own manual. The second package is designated RB2I (£69.50), and has an advanced icon-driven package to be called "ICON ARTMASTER", of which the review sample was the final prototype. The latter can also be bought separately for £25.00.

Two of the utilities produce codes to make the rollerball simulate joysticks in games, or the cursor keys in wordprocessors and spreadsheets (for example). A third lets you use the rollerball and its keys in your own programs. The Paintball program is elegantly simple, and driven by a column text menu — most people could use it without any instructions, yet quite a lot of useful drawing can easily be done with it. It includes line, circle, triangle oblong and freehand drawing, picture clear, save and load, a dot design grid, a file catalogue facility and space for a user-routine of your own.

Microdraw is quite another kettle of fish. Though it is comprehensive and flexible, it is also one of the most unfriendly pieces of software I have encountered. The organisation of the program is obscure, and similar functions require dissimilar inputs in different parts of the program, which is thoroughly confusing. Some operations are complicated, requiring multiple, unmemorable and curiously chosen keypresses (not forgetting lots of "RETURNS"). The manual gives no simple overview of the scheme of things, instructions are not clear enough (to me, at least!) and incorrect cross-references do not help. Two kinds of drawing are catered for. "TD Draw" is aimed at CAD applications where subsequent editing may be important, while "Artist's Pad" is used both for sketching and CAD. "TD Draw" supports all the normal line and figure-drawing options. The results are stored as an instruction file ("Picture File") from which the drawing can be reproduced — it can be edited, shrunk or expanded on either axis, and reloaded in a different position on the screen. It can also be overlaid on any other picture. The penalty is reduced speed, since every drawing instruction has to be executed again from scratch (after rescaling if called for). "Artist's Pad" drawings use the same instruction set with the addition of freehand components, giving "Screen Pictures", which clearly can only be saved as a complete screen. There is provision for creating user-defined characters which can then be saved and reloaded as a set, and for building them into icons of up to 6 x 6 characters. A saved file may be edited subsequently. This program embodies some very nice features, but desperately needs improving in operational simplicity and presentation.

MORE ICONOLOGY

The Icon Artmaster package is wholly icon-driven, using virtually only the RB2, and is very comprehensive, including all the normal freehand and formal drawing options. Once you have recognised the meanings of the icons it is simple to use. Like those found on car dashboards, some icons require a fair dose of lateral imagination. Purchasers will get the crib, of course, and once a few obscure sketches have been deciphered it's easy going.

The main program also contains a set of 32 patterns, any of which can be used to fill an enclosed area. The choice of styles is both wide and useful. These patterns can be replaced by a set of 32 reproducable icons. The default set contains miscellaneous technical and domestic symbols. Using the icon generator provided, however, you can design your own, which can then be loaded in place of the defaults. Each icon is designed on an 8 x 8 grid. You can incorporate the default icons into your own (with overlays if wanted), and any icon can be rotated in 90 degree increments. An unlined 7 x 7 grid is provided on which up to 49 icons can be laid out. Overlays are carried out on it, and you can use it to preview a pattern of icons, though the complete pattern cannot be saved. This is a very useful package, easily exploited after just a little practice. I have seen only a draft manual, which is understandably not complete — doubtless the final version will be more detailed.

CONCLUSIONS

Both the rollerballs are good value. The RB2 is smoother than Trackball, as would be anticipated from the respective working principles and prices. This makes it preferable for applications such as wordprocessing, in which it can replace the cursor keys and any three others, such as RETURN, DELETE and COPY. Other things being equal, the RB2 can do more than Trackball does, but there may be problems in using it with games that occupy most of memory and were designed around joysticks. As a straightforward joystick substitute, Trackball is inexpensive and perfectly adequate — but don't forget that neither can be made self-centering!

All the software items do what they claim, and the choice must depend on personal requirements. Except for the smallest, all use overlays, and can only be used sensibly with discs. Provided it fulfils your needs, Icon Artmaster is much to be preferred to Microdraw, which I can recommend only to those who would use it frequently enough to make it worthwhile mastering and remembering its codes, or those who want its particular (and undoubtedly useful) facilities. If you prefer Icon Artmaster, then it makes sense to pay £10 extra for the RB2I package initially, rather than to change over later at the cost of £25. It is also worth noting that Wigmore's Mousepaint is cheaper, can be used with either ball, is easy to use and does all the usual drawing jobs. Of the two illustrations, one was drawn by a younger visitor using the Wigmore package, and the other (kindly supplied by Micro-Draw Ltd) is obviously by a professional artist, using the RB2 with Icon-Master. Don't be fooled by the difference in artistry — either "picture" could equally well have been produced by any practicable combination of this hardware and software!

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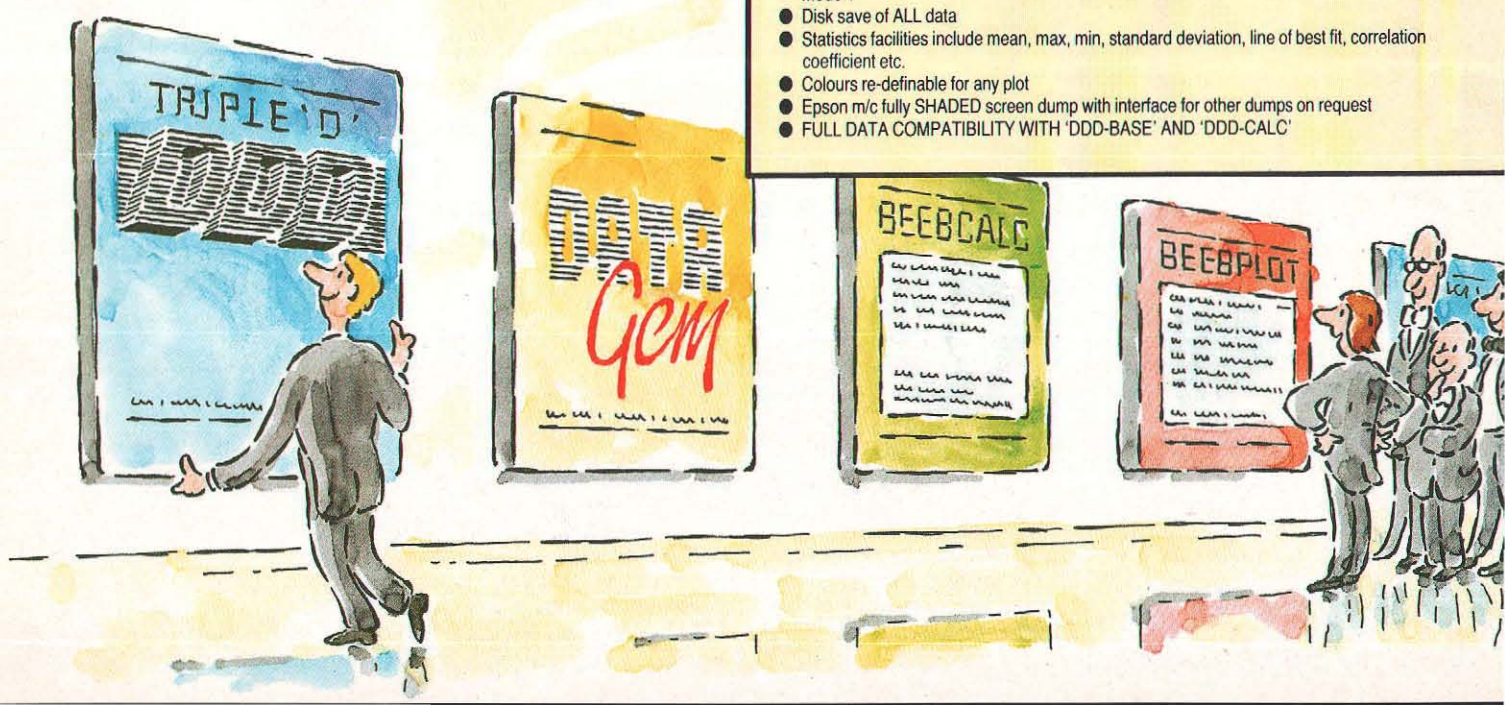

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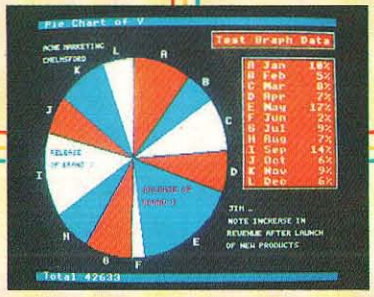

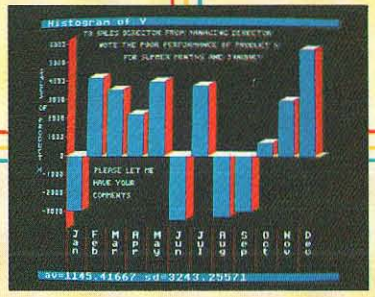

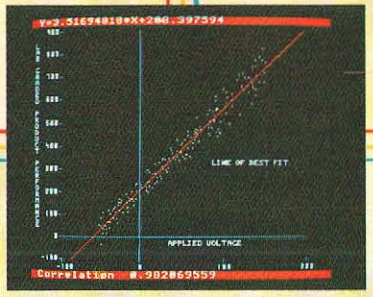

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CADpack

A Computer Aided Design package for the BBC Computer.

Fewing

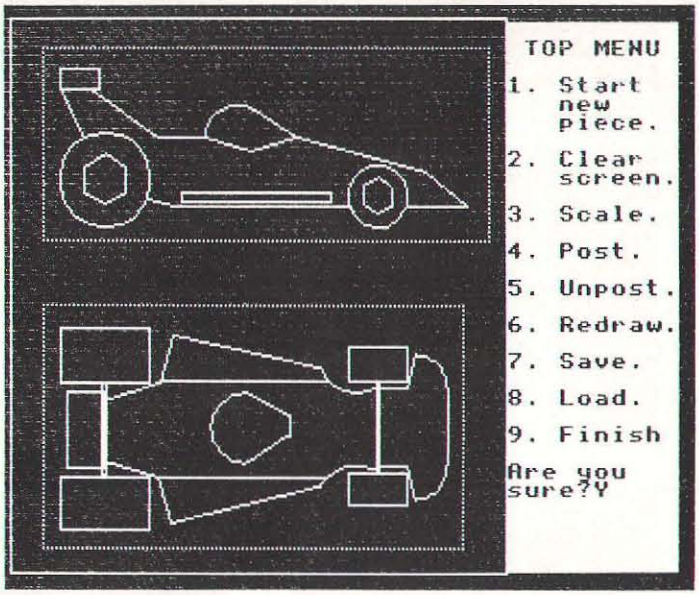
CAD PACK is a simple Computer Aided Design package for the BBC computer that illustrates how the far larger draughting packages on mainframe computers work. Using a method of point entry (either numerically or with the cursor keys and space bar) quite complex technical diagrams can be designed and manipulated on the screen, and these can then be saved on tape or disc, or perhaps used as elements of even larger and more detailed drawings.

HOW TO USE CAD PACK.

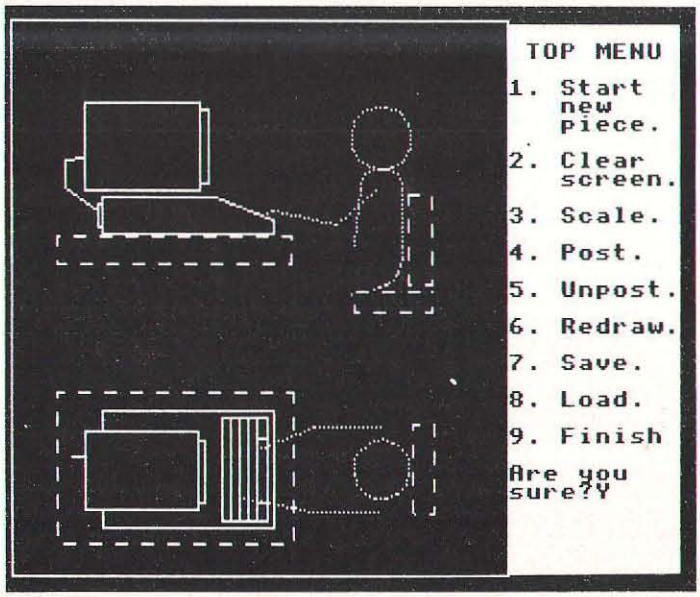
Diagrams are built up on CAD PACK by designing individual pieces, or groups, that are composed of basic items such as circles, lines or rectangles. Each of these groups has an identifying number and a local origin, so that once a group has been designed and finished it may be called by any following group as a single unit and placed anywhere upon the screen, the local origin being used to specify the new position. For example, a series of groups representing bolts, screws and corners could be designed, and finally a drawing of a metal plate incorporating many of these items could be completed on the screen.

When you run the program you are initially presented with the top menu which gives you a series of options regarding the picture:-

1. Start new piece, allows a new piece to be drawn, composed of both basic items and any previously designed pieces.
3. Scale, allows any portion of the picture so far to be redrawn so that it fills the entire screen, scale option (0) will return the screen to its normal dimensions, and option (1) will need two opposite corners of the scale box to be specified.
4. Post, and 5. Unpost, allow complete groups to be removed and replaced in the drawing. These are usually used to erase the simple groups, such as bolt heads, so that only the more complex complete diagrams are left on the screen. Their effect is only seen when the screen is redrawn.
6. Redraw, will clear the screen and redraw all the groups that are still posted, this will remove all the tiny errors that build up as mistakes are deleted and corrected in the picture.



7. Save, and 8. Load, allow finished drawings to be stored on tape or disc for future use.
9. Finishes the program.



The next menu allows you to switch between cursor and numeric (keyboard) entry, and also provides delete and opps functions that allow you to remove or replace the last item or piece drawn in the current group. Delete will remove the item from the screen and the storage array, while opps will assume you did not mean to remove the item at all and will replace it again. Only the current group being worked on can be altered by these commands.

When the 'piece finished' command is used there is no going back, and no more alterations can be made.

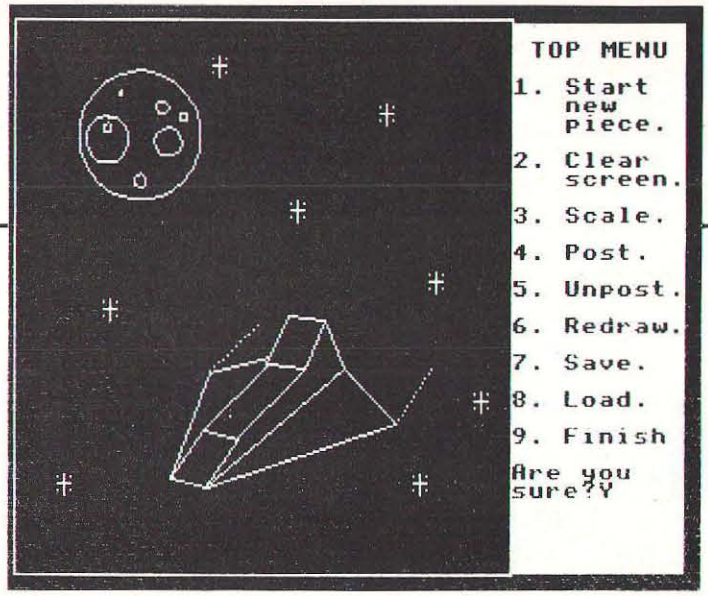
The final menu is for specific items, and is fairly self explanatory. Whenever a particular item is required the program will ask for all the necessary specifying data and will then draw the item on the screen. The different line types that can be selected affect all of the items that can be drawn.

HOW IT WORKS

The data describing the picture is stored in two arrays, GROUP% and ITEM%, using a 'structured display file'. GROUP% is used to hold the information about each group (or piece), with group 0 being held in GROUP%(x,0), group 1 in GROUP%(x,1) and so on. The data stored gives the local screen origin of the group, the number of items in the group, a pointer to where the items in this group are stored in ITEM%, and finally a post/unpost flag that says whether the group should be displayed when the picture is redrawn. (see Fig. 2.)

The local origin can be considered the 'centre' of the group, and when an old group is called by a newer one, this is the point used to locate that group. All of the data that is stored in the ITEM% array is stored relative to this origin.

In ITEM% the data for each item is stored (see Fig. 3.). The first column (numbered 0) specifies what sort of item is specified here (for example 4=rectangle 3=polygon, 2=previous group etc.), the next four columns store X and Y points of centres and edges,



although if only one X,Y point needs to be specified, the second two are left blank. If the item is an old group the next column holds the group number, otherwise it holds the number of sides for a polygon, all other sort of item leaving this slot blank. The sixth column stores the angle to be turned through, used for arcs only, and the final column stores the line type the item is drawn in (1=solid, 3=dashed etc.).

THE DRAWING ROUTINES

There are really only two procedures that actually draw items on the screen, PROCline and PROCpolygon.

PROCline draws a line between the two points passed to it when it is called, if this is a solid or dotted line type the computers inbuilt routines are used, but if a dashed line is asked for the procedure has its own line drawing algorithm, which illustrates how the machine code routines the computer uses probably work. This type of line algorithm is called a Simple Digital Differential Algorithm (SDDA) which makes it sound very mathematical and complex when in fact it is really quite simple. It works by starting at one end of the line and moving in equal steps along the X axis until the other end is reached, at each point on the X axis it decides what is the Y value nearest the actual line and puts a point there, if the difference between the Y values of the two points is greater than the X difference then the algorithm steps along the Y axis and calculates the best X position.

The polygon procedure is used to draw polygons, circles and arcs, as circles are simply drawn as polygons with a very large number of sides, and arcs are parts of circles. (The number of sides for circles is calculated as 10 + 0.1 * radius.) The polygon algorithm is quite sophisticated and does not use sines and cosines over and over again, as this would be slow and cumbersome, the technique it does use however is fairly complex mathematically but it can be summed up as an algorithm that uses the sine and cosine of the incremental angle to calculate each successive point. And if it still seems slow, remember that dotted and dashed circles can also be drawn because of the calls to the line procedure.

THE VARIABLES

dash	Used to control the size of the dashed lines being drawn.
GN%	Current group number.
ITM%	Current item number.
GST%	Location in ITEM% where current group starts.
LOX%	X value of current local origin.
LOY%	Y value of current local origin.
GPTR%	Pointer to GROUP% array.
IPTR%	Pointer to ITEM% array.
PE%	Keyboard or cursor key control indicator.
X% and Y%	Current position of cursor.
style	Current line type (1=solid)
move_factor	Used to ensure rapid movement of cursor.
flag%	Indicates arrays are full.
SCALEX	Scaling factor for X axis.
SCALEY	Scaling factor for Y axis.
XOFF	Offset on X axis when scaled.
YOFF	Offset on Y axis when scaled.

SCALING

Scaling is in fact remarkably easy with this sort of program, and involves subtracting the value of the new origin from each point describing the item being drawn and then multiplying each X and Y value by a scaling value, for example two if the picture is to be twice as big. The graphics routines within the computer will sort out any lines that no longer fall on the screen, and we don't have to worry about clipping or lines coming on the other side of the screen, as the computer does all that for us as well. If new items are entered while the screen is scaled, the X and Y values stored in the ITEM% array have to have the reverse of the above done to them so that their true values are stored, so they would be divided by the scaling factors and then have the current origin added to them. Remember, when the screen is scaled, squares will probably not be square any more as the X and Y axis will be stretched by different amounts.

CONTINUED OVER

SAVING AND LOADING

When a picture is saved the entire contents of GROUP% and ITEM% are saved, along with the pointers for each array, so when they are reloaded further detail can be added to the pictures if required.

THE PROGRAM

Lines 10 – 50 These constitute the main body of the program, they call a procedure to set up the screen in the desired manner, and then goto the top menu procedure. The additional lines are to ensure accidental erasure of a diagram can be avoided.

PROCset_screen This procedure initialises all of the global variables used in the program. Most important of these are the current group and item (GN% and ITM%) and the pointers to the group and item arrays (GPTR% and IPTR%). The scaleing factors, SCALEX, SCALEY, OFFX and OFFY are set to cover the whole screen, these are altered later when the scale command is used.

After this the screen is cleared and then set up with most of the left hand side as a graphics window, and the rest of the right hand side as text. If a screen dump is to be used, the graphics window is from 16 to 926 on the X axis and 32 to 992 on the Y axis, with the origin moved to 16,32.

PROCpiece_parts PROCitem PROCtop_menu These are the three main menus used to enter selections and call appropriate procedures.

PROCpolygon This procedure is used to draw polygons, circles and arcs. The data it recieves is the centre of the shape, the first point on the edge, the number of sides and the anticlockwise angle to be turned through.

PROCline If a solid or dotted line is called here the procedure uses the inbuilt computer routines, for speed, but any of the three dashed line types will result in the line being drawn with the simple DDA algorithm that makes up the second half of the routine.

PROCrectangle A procedure to draw a rectangle given two opposing corners.

PROCset_line PROCcircle These procedures read in the data for lines and circles to be drawn, and then call the appropriate drawing routines.

PROCchange_line This is a menu that enables the user to select the line pattern (solid, dashed etc.) that the following shapes are to be drawn in. Until the line type is changed all following shapes will be in this pattern.

PROCpoint PROCset_poly PROCarc PROCset_rect These are called to read in data for points, rectangles and polygons.

PROCdelete PROCopps These routines allow mistakes to be corrected. Delete will erase the last item, in the current group, from the screen and move the item pointer back one. Opps will, if possible, undo the delete command and replace the item just erased back onto the screen and into the item array.

PROCnew_piece When a new group is started this procedure is called, and it stores all of the appropriate information in the group array concerning the previous group, and sets up the variables for the new group.

PROCwrite A space saving procedure that writes data into the item array, thereby saving repetition of the lines within it.

PROCold_piece This is called when a new group wants to make an old group one of its items. It asks for the old group number and then asks where to position it, whereupon it draws it.

PROCdraw_group A procedure that is often recursive. Using the data stored in the group array concerning the start of data in the item array and the number of items to be drawn, the group number L% will be redrawn at point M%, N%. If one the items is another group a recursive call is made.

PROCredraw A procedure that will redraw from scratch the drawing so far, after clearing the screen. Basically it sequences through the group array, drawing every posted group.

PROCsave PROCload These two procedures will store or reload all of the data in the group and item arrays, as well as the pointers to them, on or from disc.

PROCscale Using scaler multipliers and offsets, this routine enables the screen to be scaled so that any indicated section will now cover the entire screen.

PROCread_point PROCdraw_cursor These routines are used to read in the points specifying the various items. The entry of points is either by keyboard or by cursor keys and the space bar. When the screen is scaled, this allowed for in data entry by cursor keys.

PROCpause A simple buffer flush and delay routine.

PROCclocal Used to read in the local origin of each group.

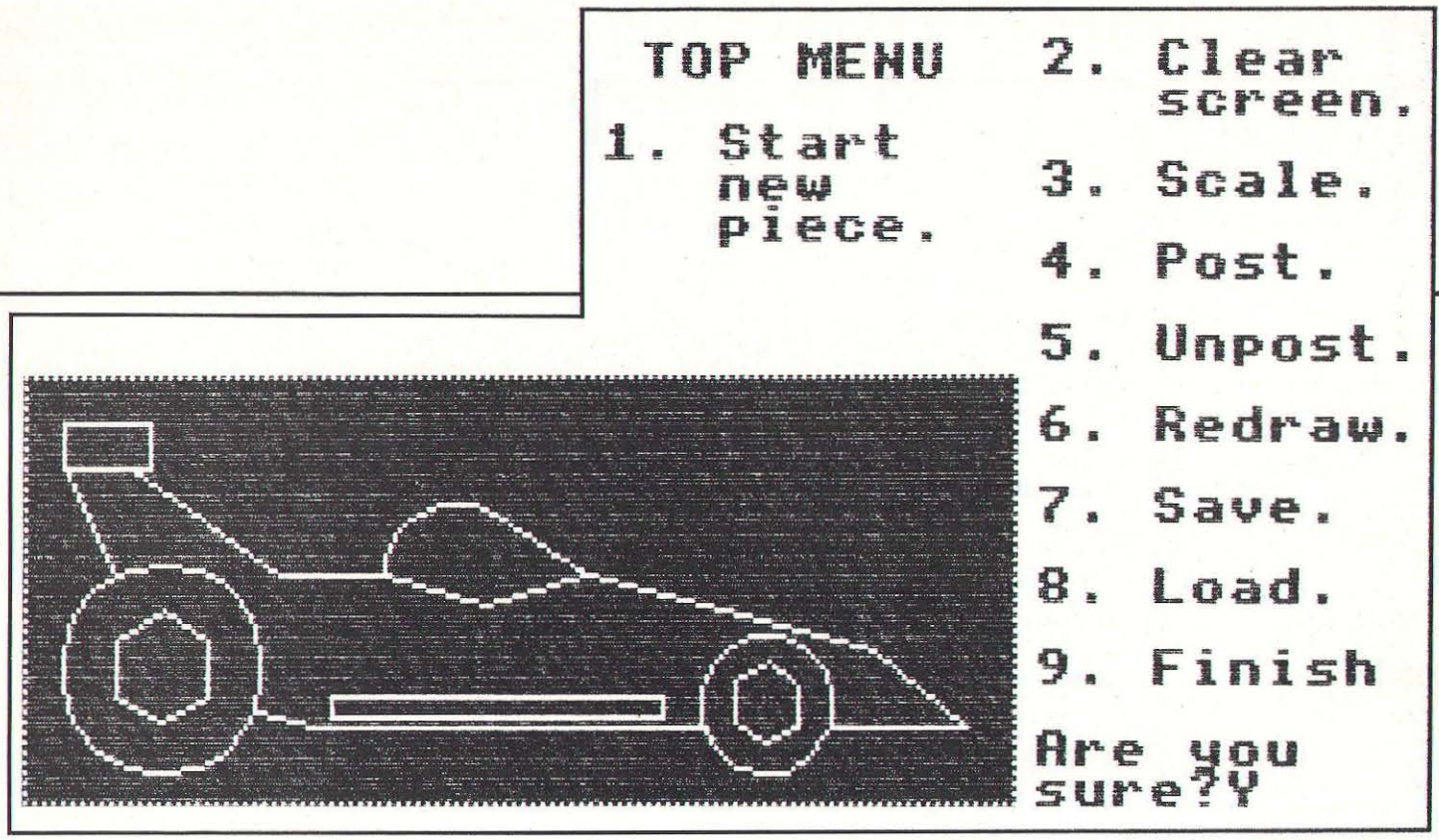
PROCpost PROCunpost Any group may be posted or unposted with these two procedures. They will only be redrawn or deleted when the screen is redrawn however.

PROCkey_cur This allows the user to switch between keyboard and cursor key point entry.

PROCdraw This procedure is passed the various items from the item array and calls the appropriate drawing procedures. If delete_flag is set, the items are drawn in the background colour to remove them.

PROGRAM LISTING

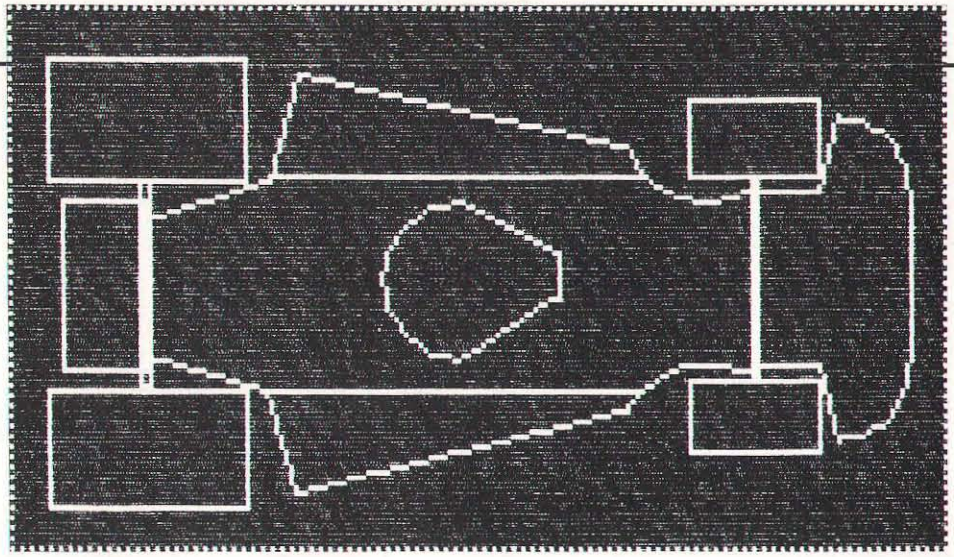
```
   10REM.. CAD PACKAGE FOR THE BBC COMPUTER...
   20MODE 4:PROCset_screen
   30PROCtop_menu
   40INPUT'"Are you"'"sure";A$
   50IF LEFT$(A$,1)<>"Y" THEN 30
   60VDU 26:CLS:END
   70
   80DEF PROCset_screen
   90dash=0:on_off=69:GN%=0:ITM%=0:GST%=0:LOX%=0:L
OY%=0:GPTR%=0:IPTR%=0:PE%=-1:X%=12:Y%=12:style=1:m
ove_factor=1:flag%=0:DIM GROUP%(4,15):DIM ITEM%(7,
50)
  100SCALEX=1:SCALEY=1:XOFF=0:YOFF=0:delete_flag=0
  110VDU 26:CLS:GCOL0,0:GCOL0,129
  120CLG:MOVE 12,28:DRAW 12,996:DRAW 928,996:DRAW
928,28:DRAW 12,28
  130VDU 28,29,30,38,1:CLS
  140VDU 24,16;32;926;992;
  150VDU 29,16;32;
  160ENDPROC
  170
  180DEF PROCpiece_parts
  190CLS:PRINT'"   MENU."''"1. Draw"'"   Item."''"
2. Key /"'"   Cursor."'"3. Delete."'"4. Opps."''"5
. Finish   piece."
  200PRINT''" Current"'"  piece"'"  no.=";GPTR%-1:
PROCpause
  210A$=INKEY$(10):IF A$="" GOTO 210
  220IF A$="1" PROCitem
  230IF A$="2" PROCkey_cur
  240IF A$="3" PROCdelete
  250IF A$="4" PROCopps
  260IF A$<>"5" GOTO 190
  270ENDPROC
  280
  290DEF PROCitem
  300CLS:PRINT'"   ITEMS."''"1. Point."''"2. Line.
"''"3. Rectngl"'"4. Polygon"'"5. Circle."'"6. Arc.
"''"7. Full"'"   Piece."''"8. Line"'"   Type."''"9
. Last"'"   Menu."
  310PRINT''" Current"'"  piece"'"  no.=";GPTR%-1:
PROCpause
  320B$=INKEY$(10):IF B$="" GOTO 320
  330IF flag% GOTO 420
  340IF B$="1" PROCpoint
  350IF B$="2" PROCset_line
  360IF B$="3" PROCset_rect
  370IF B$="4" PROCset_poly
  380IF B$="5" PROCcircle
  390IF B$="6" PROCarc
  400IF B$="7" PROCold_piece
  410IF B$="8" PROCchange_line
  420IF B$<>"9" GOTO 300
  430ENDPROC
  440
  450DEF PROCtop_menu
  460CLS:PRINT'" TOP MENU"''"1. Start"'"   new"'"
 piece."''"2. Clear"'"   screen."'"3. Scale."''"4
. Post."''"5. Unpost."'"6. Redraw."'"7. Save."''"8
. Load."''"9. Finish"
```




```
  470PROCpause
  480E$=INKEY$(10):IF E$="" GOTO 480
  490IF E$="1" PROCnew_piece
  500IF E$="2" CLG
  510IF E$="3" PROCscale
  520IF GPTR%=0 GOTO 570
  530IF E$="4" PROCpost
  540IF E$="5" PROCunpost
  550IF E$="6" PROCredraw
  560IF E$="7" PROCsave
  570IF E$="8" PROCload:PROCredraw
  580IF E$<>"9" GOTO 460
  590ENDPROC
  600
  610DEF PROCpolygon(XC%,YC%,X,Y,nsides%,angle)
  620radius%=SQR((XC%-X)^2+(YC%-Y)^2):angle=angle/
57.29578:nsides%=ABS(nsides%)
  630Dtheta=angle/nsides%:cosdth=COS(Dtheta):sindt
h=SIN(Dtheta)
  640FOR K =1 TO nsides%
  650E1=X:E2=Y
  660XN=XC%+(X-XC%)*cosdth-(Y-YC%)*sindth
  670Y=YC%+(X-XC%)*sindth+(Y-YC%)*cosdth:X=XN
  680PROCline(E1,E2,X,Y,style)
  690NEXT
  700ENDPROC
  710
  720DEF PROCline(X1,Y1,X2,Y2,line_type)
  730X1=(X1-XOFF)*SCALEX:Y1=(Y1-YOFF)*SCALEY:X2=(X
2-XOFF)*SCALEX:Y2=(Y2-YOFF)*SCALEY
  740MOVE X1,Y1:IF line_type=0 PLOT 7,X2,Y2:ENDPRO
C
  750IF line_type=1 OR (X1=X2 AND Y1=Y2) PLOT 5,X2
,Y2:ENDPROC
  760IFline_type=2 PLOT 21,X2,Y2:ENDPROC
  770gap=(style-2)*6 : REM.. sets up count for dif
ferent dash gaps..
  780L=ABS(X2-X1):IF ABS(Y2-Y1)>L THEN L=ABS(Y2-Y1
)
  790x_inc=4*(X2-X1)/L : y_inc=4*(Y2-Y1)/L : X1=X1
+.5 : Y1=Y1+.5
  800FOR I = 1 TO L STEP 4
  810dash=dash+1:IF dash<gap GOTO 830
  820dash=0:IF on_off=69 on_off=68 ELSE on_off=69
  830PLOT on_off,X1,Y1
  840X1=X1+x_inc:Y1=Y1+y_inc
  850NEXT
  860ENDPROC
  870
  880DEF PROCrectangle(X1,Y1,X2,Y2)
  890PROCline(X1,Y1,X1,Y2,style):PROCline(X1,Y2,X2
,Y2,style)
  900PROCline(X2,Y2,X2,Y1,style):PROCline(X2,Y1,X1
,Y1,style)
  910ENDPROC
  920
  930DEF PROCset_line
  940CLS:PRINT'"Enter"'" start of"'"line.":PROCrea
d_point:X1=X%:Y1=Y%:PRINT'"Enter end"'"of line.":P
ROCpause:PROCread_point
  950PROCwrite(5,X1,Y1,X%,Y%,0,0,style)
  960PROCline(X1,Y1,X%,Y%,style):ENDPROC
  970
  980DEF PROCcircle
  990CLS:PRINT'"Enter the"'"centre of"'"the circle
":PROCread_point:X1=X%:Y1=Y%:PRINT'"Enter a"'"poin
t on"'"the edge":PROCpause:PROCread_point
 1000RD=SQR((X1-X%)^2+(Y1-Y%)^2):SD%=10+.1*RD

 1010PROCwrite(3,X1,Y1,X%,Y%,SD%,360,style)
 1020PROCpolygon(X1,Y1,X%,Y%,SD%,360)
 1030ENDPROC
 1040
 1050DEF PROCchange_line
 1060CLS:PRINT'"Line Menu.~~~~~~~~~~"'"1. Solid."'
'"2. Dotted."'"3. Dash(S)"'"4. Dash(M)"'"5. Dash(L
)":PROCpause
 1070C$=INKEY$(10):IF C$="" GOTO 1070
 1080style=VAL(C$):IF style>5 OR style<1 GOTO 1060
 ELSE ENDPROC
 1090
 1100DEF PROCpoint
 1110CLS:PRINT'"Enter the"'"point.":PROCread_point
 1120PROCwrite(5,X%,Y%,X%,Y%,0,0,style)
 1130PROCline(X%,Y%,X%,Y%,style):ENDPROC
 1140
```

CONTINUED OVER



```
 1150DEF PROCset_poly
 1160CLS:PRINT'"Enter the"'"centre of"'"polygon.":
PROCread_point:X1=X%:Y1=Y%:PROCpause
 1170PRINT'"Enter one"'"of the "'"Vertices.":PROCr
ead_point
 1180PROCpause:INPUT'"How many"'"Sides";SD%
 1190PROCwrite(3,X1,Y1,X%,Y%,SD%,360,style)
 1200PROCpolygon(X1,Y1,X%,Y%,SD%,360):ENDPROC
 1210
 1220DEF PROCarc
 1230CLS:PRINT'"Enter the"'"centre of"'"the arc.":
PROCread_point:X1=X%:Y1=Y%:PROCpause
 1240PRINT'"Enter a"'"point on"'"the radius";:PROC
read_point:PROCpause
 1250INPUT'"What is"'"the angle"'"to be"'"turned "
'"through"'"(Clockwse)";AN%
 1260RD=SQR((X1-X%)^2+(Y1-Y%)^2):NS%=12+.2*RD*ABS(
AN%)/360:AN%=-AN%
 1270PROCwrite(3,X1,Y1,X%,Y%,NS%,AN%,style)
 1280PROCpolygon(X1,Y1,X%,Y%,NS%,AN%):ENDPROC
 1290
 1300DEF PROCset_rect
 1310CLS:PRINT'"Enter one"'"corner of"'"the shape.
":PROCread_point:X1=X%:Y1=Y%:PROCpause
 1320PRINT'"Enter the"'"opposite"'" corner":PROCre
ad_point
 1330PROCwrite(4,X1,Y1,X%,Y%,0,0,style)
 1340PROCrectangle(X1,Y1,X%,Y%):ENDPROC
 1350
 1360DEF PROCdelete
 1370P%=IPTR%-1:IF P%<ITM% ENDPROC
 1380IF ITEM%(0,P%)<>2 GOTO 1430
 1390delete_flag=1
 1400PROCdraw_group(ITEM%(5,P%),ITEM%(1,P%)+LOX%,I
TEM%(2,P%)+LOY%)
 1410delete_flag=0
 1420GOTO 1440
 1430PROCdraw(ITEM%(0,P%),ITEM%(1,P%)+LOX%,ITEM%(2
,P%)+LOY%,ITEM%(3,P%)+LOX%,ITEM%(4,P%)+LOY%,ITEM%(
5,P%),ITEM%(6,P%),0)
 1440IPTR%=P%:ENDPROC
 1450
 1460DEF PROCopps
 1470IF ITEM%(0,IPTR%)<2 GOTO 1510
 1480P%=IPTR%:IPTR%=IPTR%+1
 1490IF ITEM%(0,P%)=2 PROCdraw_group(ITEM%(5,P%),I
TEM%(1,P%)+LOX%,ITEM%(2,P%)+LOY%):ENDPROC
 1500PROCdraw(ITEM%(0,P%),ITEM%(1,P%)+LOX%,ITEM%(2
,P%)+LOY%,ITEM%(3,P%)+LOX%,ITEM%(4,P%)+LOY%,ITEM%(
5,P%),ITEM%(6,P%),ITEM%(7,P%))
 1510ENDPROC
 1520
 1530DEF PROCnew_piece
 1540IF GPTR%>20 ENDPROC
 1550ITM%=IPTR%:GST%=GPTR%:LOX%=0:LOY%=0:GROUP%(4,
GPTR%)=-1:GROUP%(3,GPTR%)=ITM%:GPTR%=GPTR%+1
 1560PROClocal:PROCpiece_parts
 1570GROUP%(2,GST%)=IPTR%-ITM%:GROUP%(0,GST%)=LOX%
:GROUP%(1,GST%)=LOY%
 1580ENDPROC
 1590
 1600DEF PROCwrite(T%,A%,B%,C%,D%,SD%,AN%,ST%)
 1610ITEM%(0,IPTR%)=T%:ITEM%(1,IPTR%)=A%-LOX%:ITEM
%(2,IPTR%)=B%-LOY%:ITEM%(3,IPTR%)=C%-LOX%:ITEM%(4,
IPTR%)=D%-LOY%:ITEM%(5,IPTR%)=SD%:ITEM%(6,IPTR%)=A
N%:ITEM%(7,IPTR%)=ST%
 1620IPTR%=IPTR%+1:IF IPTR%>=50 flag%=-1
 1630ENDPROC
 1640
 1650DEF PROCold_piece
 1660CLS:IF GPTR%=1 ENDPROC
 1670PRINT'"Enter the"'"number of"'"the old "'"pie
ce";:INPUT N%:IF N%>=GPTR% GOTO 1670:IF N%<0 ENDPR
OC
 1680PRINT''"Enter the"'"new originfor the"'"piece
":PROCread_point
 1690ITEM%(0,IPTR%)=2:ITEM%(1,IPTR%)=X%-LOX%:ITEM%
(2,IPTR%)=Y%-LOY%:ITEM%(5,IPTR%)=N%:IPTR%=IPTR%+1

 1700IF IPTR%>0 ITEM%(7,IPTR%)=ITEM%(7,IPTR%-1)
 1710PROCdraw_group(N%,X%,Y%)
 1720ENDPROC
 1730
 1740DEF PROCdraw_group(L%,M%,N%)
 1750LOCAL group%,Xo%,Yo%,loop
 1760group%=L%:Xo%=M%:Yo%=N%
 1770FOR loop = GROUP%(3,group%) TO GROUP%(3,group
%)+GROUP%(2,group%)-1
 1780IF ITEM%(0,loop)=2 PROCdraw_group(ITEM%(5,loo
```

```
p),ITEM%(1,loop)+Xo%,ITEM%(2,loop)+Yo%):GOTO 1800
 1790PROCdraw(ITEM%(0,loop),ITEM%(1,loop)+Xo%,ITEM
%(2,loop)+Yo%,ITEM%(3,loop)+Xo%,ITEM%(4,loop)+Yo%,
ITEM%(5,loop),ITEM%(6,loop),ITEM%(7,loop))
 1800NEXT
 1810ENDPROC
 1820
 1830DEF PROCredraw
 1840CLG
 1850GPTR%=0:IF GROUP%(2,GPTR%)=0 ENDPROC
 1860REPEAT
 1870IF GROUP%(4,GPTR%)=-1 PROCdraw_group(GPTR%,GR
OUP%(0,GPTR%),GROUP%(1,GPTR%))
 1880GPTR%=GPTR%+1
 1890UNTIL GPTR%=21 OR GROUP%(2,GPTR%)=0
 1900ENDPROC
 1910
 1920DEF PROCsave
 1930CLS:INPUT'"File"'"name";A$:A$=LEFT$(A$,6)
 1940CLOSE#0:A=OPENOUT(A$)
 1950PRINT'"Saving"'"data file"
 1960PRINT# A,IPTR%,GPTR%
 1970FOR loop=0 TO 50
 1980FOR inner_loop =0 TO 7
 1990IF loop<16 AND inner_loop<5 PRINT# A,GROUP%(i
nner_loop,loop)
 2000PRINT#A,ITEM%(inner_loop,loop)
 2010NEXT:NEXT
 2020CLOSE#A:ENDPROC
 2030
 2040DEF PROCload
 2050CLS:INPUT'"Loading"'"file"'"name";A$:A$=LEFT$
(A$,6)
 2060REM..Cassette users must correctly
 2070REM..position the file in the tape recorded
 2080A$=LEFT$(A$,6):A=OPENIN(A$)
 2090PRINT'"Reading"'"in data"
 2100INPUT# A,IPTR%,GPTR%
 2110FOR loop=0 TO 50
 2120FOR inner_loop =0 TO 7
 2130IF loop<16 AND inner_loop<5 INPUT# A,GROUP%(i
nner_loop,loop)
 2140INPUT#A,ITEM%(inner_loop,loop)
 2150NEXT:NEXT:PRINT'"REDRAWING"
 2160CLOSE#A:ENDPROC
 2170
 2180DEF PROCscale
 2190CLS:PRINT'"Enter (0)"'"for normalscreen."''"E
nter (1)"'"for new"'"box."
 2200INPUT Q
 2210IF Q=0 SCALEX=1:SCALEY=1:XOFF=0:YOFF=0:GOTO 2
300 ELSE IF Q<>1 GOTO 2310
 2220CLS:PRINT'"Enter the"'"first"'"corner of"'"th
e scale"'"box":PROCread_point

 2230a%=X%:b%=Y%:IF a%<0 OR b%<0 GOTO 2220
 2240PRINT''"Enter the"'"opposite"'"corner":PROCre
ad_point
 2250IF X%=a% OR Y%=b% OR X%<0 OR Y%<0 GOTO 2240
 2260IF a%>X% TEMP%=a%:a%=X%:X%=TEMP%
 2270IF b%>Y% TEMP%=b%:b%=Y%:Y%=TEMP%
 2280XOFF=a%:YOFF=b%
 2290SCALEX=910/(X%-a%):SCALEY=960/(Y%-b%)
 2300PROCredraw
 2310ENDPROC
 2320
 2330DEF PROCread_point
 2340X%=(X%-XOFF)*SCALEX:Y%=(Y%-YOFF)*SCALEY
 2350PROCdraw_cursor:IF NOT(PE%) PROCdraw_cursor:I
NPUT X%,Y%:X%=(X%/SCALEX)+XOFF:Y%=(Y%/SCALEY)+YOFF
:ENDPROC
 2360CY=0:CX=0:IF INKEY(-58) CY=4
 2370IF INKEY(-42) CY=-4
 2380IF INKEY(-26) CX=-4
 2390IF INKEY(-122) CX=4
 2400IF CX=0 AND CY=0 move_factor=1:GOTO 2460 ELSE
 PROCdraw_cursor
 2410CX=CX*move_factor*SCALEX:CY=CY*move_factor*SC
ALEY:IF move_factor<8 move_factor=move_factor+1
 2420X%=X%+CX:Y%=Y%+CY
 2430IF X%>912 OR X%<0 X%=X%-CX
 2440IF Y%>960 OR Y%<0 Y%=Y%-CY
 2450PROCdraw_cursor
 2460IF INKEY(-99) THEN PROCdraw_cursor:X%=(X%/SCA
LEX)+XOFF:Y%=(Y%/SCALEY)+YOFF:ENDPROC ELSE GOTO 23
60
 2470
 2480DEF PROCdraw_cursor
 2490MOVE X%-12,Y%:PLOT 6,X%-4,Y%:MOVE X%+4,Y%:PLO
T 6,X%+12,Y%
 2500MOVE X%,Y%-12:PLOT 6,X%,Y%-4:MOVE X%,Y%+4:PL
OT 6,X%,Y%+12
 2510ENDPROC
 2520
 2530DEF PROCpause
 2540FOR WAIT=1 TO 100:NEXT
 2550*FX 15,1
 2560ENDPROC
 2570
 2580DEF PROClocal
 2590CLS:PRINT'"Enter the"'"origin of"'"this group
of items.":PROCpause:PROCread_point
 2600LOX%=X%:LOY%=Y%:ENDPROC
 2610
 2620DEF PROCunpost
 2630CLS:PRINT'"Latest"'"piece"'"no.=";GPTR%-1
 2640INPUT'"Unpost"'"which "'"piece";GN%
 2650IF GN%<0 OR GN%>=GPTR% ENDPROC
 2660GROUP%(4,GN%)=0:ENDPROC
 2670
 2680DEF PROCpost
 2690CLS:PRINT'"Latest"'"piece"'"no.=";GPTR%-1
 2700INPUT'"Post"'"which "'"piece";GN%
 2710IF GN%<0 OR GN%>=GPTR% ENDPROC
 2720GROUP%(4,GN%)=-1:ENDPROC
 2730
 2740DEF PROCkey_cur
 2750CLS:PRINT'"Enter (1)"'"for Cursor"'"Enter (2)
"'"for"'"Keyboard":*FX 15,1
 2760INPUT Q%:IF Q%=1 PE%=-1 ELSE IF Q%=2 PE%=0 EL
SE GOTO 2750
 2770X%=XOFF:Y%=YOFF
 2780ENDPROC
 2790
 2800DEF PROCdraw(T%,A%,B%,C%,D%,NS%,AN%,type)
 2810temp=style:style=type
 2820IF delete_flag=1 style=0
 2830IF T%=3 PROCpolygon(A%,B%,C%,D%,NS%,AN%):GOTO
 2860
 2840IF T%=4 PROCrectangle(A%,B%,C%,D%):GOTO 2860
 2850IF T%=5 PROCline(A%,B%,C%,D%,style):GOTO 2860
 2860style=temp:ENDPROC
 2870REM.. AUTHOR Russell Fewing ..
 2880REM.. British Telecom Computer Engineer..
```

Events

Alan Rowley

Make an event of it! Learn how to harness this powerful feature of the BBC and Electron.

One of the characteristics of a microprocessor such as the 6502 central processing unit(CPU) in the BBC micro is that it is only capable of doing one thing at once. Often, however, you have the impression that a whole lot of things are happening simultaneously on your Beeb, but this is an illusion created by the ability of the CPU to switch quickly from one task to another.

The main mechanism used to achieve this switching is the use of interrupts. When a particular piece of the hardware requires the services of the CPU it issues an interrupt signal, a sort of electronic tap on the shoulder. The CPU can then temporarily suspend what it is currently doing and attend to the requirements of the interruptor, the technical term is "service the interrupt".

The processor then takes up its former task again where it left off. The whole machine actually runs under a constant stream of interrupts from the various internal pieces of hardware. In addition to this interrupt mechanism, which actually runs the machine, there is a kind of secondary facility provided for the user's convenience known as the "events", and which are designed to be used to call code which we have written ourselves.

TAKING NOTICE

An event is an interrupt that is issued by the operating system whenever some particular happening occurs in the machine. The figure shows some of the most useful of the 9 events which the designers of the BBC have given us access to. You will find a full list in your User Guide. The point about events is that they do not *normally* lead to any action but we can choose to take notice of them and arrange for something to be done in response.

When the machine is first switched on or the break key is pressed, all of the events are disabled. That means that nothing happens when they occur, but any particular event can be activated by a call to "*FX14,n", where n is the event number. When any of the enabled events occurs the processor stops what it is doing and jumps to an address contained in the two bytes at locations &220 and &221, the most significant byte is in location &221. In technical language we say that the processor "indirects" through the vector at &220.

This vector normally points to a routine in the operating system which does not actually do anything, it merely tidies up and sends the processor back to what it was doing, but if we change the value of the vector so that it points to some code written by us, that code will be called by the events. We can thus use an event to carry out some task, which need be in no way related to what caused the event in the first place. The great value of this is that this task will keep being executed in the "background" whenever the event occurs, irrespective of what else the machine is doing in the "foreground", perhaps running a program or just sitting in direct mode. If we use the start of vertical synch event as our trigger, for example, the program will run 50 times per second.

In order to make use of an event, we must do two things, having first of all installed the code to be executed by the event, of course. Firstly we must change the event vector to point to the code and, secondly, we have to enable the event with the "*FX14" call. The order here, by the way, is important since if you first enable the event and *then* try to change the vector you will probably crash your machine, since the event might happen whilst the vector is in the process of being changed and this will confuse the processor totally. You will certainly cause such a crash if you are dealing with an event which happens often, like the vertical synch.

RULES AND REGULATIONS

The routine to be run by the event must, of course, be written in machine code rather than BASIC. Don't stop reading here, machine code is not really very difficult and, as you will see, we can do some very useful things with some quite simple examples.

Before we go further, it is necessary to know that any event handling routine must conform to certain rules. Firstly it must preserve the state of the CPU, which means that the processor must "look" the same after running the code in the event handler routine as it did before. If you think back to what I said above, this rule is very sensible since the processor has to be able to go back to whatever foreground task it left to service the event without becoming lost. What we must do then is to keep a copy of the state of the processor when the event occured and restore that copy after the event has been processed. In order to be able to do this the first thing that the event handler must do is to copy the values in all the important processor registers onto the stack, lines 90 to 140 of listing 1 do this. At the end of the routine all the registers are recovered from the stack, lines 220 to 270, remembering that the stack operates on a first in last out basis.

The second rule that we must obey is that the routine must not be too long, it should normally last no more than two milliseconds. The reason for this is that the event handling routine is entered with interrupts disabled and if this situation persists for too long some vital machine functions may not be able to be carried out and you may find that your Beeb just goes to sleep. It is very unlikely, however that you will exceed the time limit unless you attempt something really complex.

The third rule is that the event handler must not enable interrupts. The reason for this is to ensure that the event is fully serviced before the processor is interrupted again since there can be no guarantee that a routine called by an interrupt will return with the processor in a fit state to continue with the event code.

This rule may seem to be no problem, but one piece of advice that follows from it is very restrictive and that is that the event handler should not call any operating system routines since some of these will, for their own purposes, re-enable interrupts under some circumstances.

It seems, however, that in this respect, rule three is made to be broken. I routinely call the operating system from events, if you do not, what you can do is very res-

SOME OF THE BBC'S EVENTS

Event Number 2 Character entering input buffer. Normally a key press. The Y register has the ASCII code of the key.

3 Analogue to digital conversion complete. Occurs roughly every 10 milliseconds. The X register contains the A/D channel number.

4 Start of vertical synch pulse. Issued every time the screen scan starts, that is 50 times per second.

5 Interval timer crossing zero. This is not the BASIC TIME but a separate timer which can be set by the user.

6 Escape. Normally generated by the escape key.

```
   10 oswrch=&FFEE
   20 ?&70=?&220:?&71=?&221:REM*PRESERVE OLD VECTOR*
   30 ?&220=0:?&221=&C:REM*REDIRECT EVENT VECTOR*
   40 FOR I%=0 TO 2 STEP 2:REM*TWO PASSES AS FORWARD JU
MPS*
   50 P%=&C00:REM*LOCATION FOR ASSEMBLED CODE*
   60 [
   70 OPT I% \No errors on first pass
   80 STA &72 \Temporary Store Accumulator
   90 PHA \Accumulator>Stack
  100 PHP \Status Register>Stack
  110 TXA \X Register>Accumulator
  120 PHA \Accumulator>Stack
  130 TYA \Y Register>Accumulator
  140 PHA \Accumulator>Stack
  150 LDA &72 \Recover Acumulator
  160         \which Contains Event No.
  170 CMP #2 \Is it a Keyboard Event ?
  180 BNE exit \If not exit
  190 LDA #151 \White Graphics Teletext Code>Acc.
  200 JSR oswrch \Print it on Screen
  210 .exit
  220 PLA \Stack>Accumulator
  230 TAY \Accumulator>Y Reg.
  240 PLA \Stack>Accumulator
  250 TAX \Accumulator>X Reg.
  260 PLP \Stack>Status Reg.
  270 PLA \Stack>Accumulator
  280 JMP (&70) \Jump to normal event handling
  290 ]
  300 NEXT
  310 MODE 7
  320 END
>
```

tricted. My advice is to "suck it and see" and my experience that you almost invariably get away with it. I have even called routines in the BASIC ROM from event handlers, which will probably make the purists' hair stand on end !

PUTTING EVENTS TO WORK

Well, that is all the theory. Let's now look fairly closely at an example of an event handling routine, Listing 1, which uses event number 2 to print the teletext control code for white graphics on the mode 7 screen. Since event 2 is effectively generated by a key press the result is to print the teletext control character ahead of the character generated by the key and so the keyboard produces, not the normal characters, but the graphics character set shown on pages 488-9 of your User Guide. Each character will, of course, appear to be preceded by a space, which is actually the control character. This is printed by loading its ASCII code, 151, into the accumulator and then calling the operating system write character routine, OSWRCH, in lines 190 and 200. This is the machine code equivalent of VDU 151.

These two lines are all that are involved in actually doing the job — the rest of the listing is concerned with setting up and keeping things tidy. Line 20 takes the current values in the event vector and copies them into two page zero locations. The object of this is so that we can leave our event handling routine, at line 280, by a jump to the same address as the event would have called if we had not intercepted it to do our bidding. This is the safest way to leave the event handler since it gives an orderly return under the supervision of the operating system.

Line 30 changes the event vector to point to our new code. I have chosen to put the code at &C00, which is the area which contains user defined characters but you can assemble the code at any location that is convenient. Just change P% which is used by the assembler as the code origin as well as the values poked in line 30.

I have already dealt with the preservation and recovery of the registers, the only other lines in Listing 1 requiring comment are concerned with checking that the event is, indeed, a key press. The point is that once we have redirected the event vector the occurrence of *any* event which is enabled will cause the code to be run . The simplest way to ensure that only the event that you want to use will call the routine is to make sure that it is the only one enabled, but there is no harm in arranging for the code itself to ignore all events but the correct one. This is easy to do because when the event routine is entered, the accumulator contains the event number. At line 80 I have tucked this value away on page zero whilst the registers are stacked and then recalled it at line 150. Line 170 then checks whether the value is 2, and hence that the desired event has called the routine.

If this is not the case, line 180 causes a branch around the business part of the machine code. If you run the program in Listing 1 you will find yourself returned to a blank, MODE 7 screen. Now type "*FX14,2‹RETURN›" to enable the event and you should find that any lower case letter entered at the keyboard appears as a graphics character. You can switch off the effect and return to normal by entering "*FX13,2‹RETURN›", which disables the event. Ignore what appears on the screen, just type carefully. Notice that all this is happening in direct mode, pressing a key runs the machine code. The best way to return your machine to normal is by pressing Break as this resets the vector and disables all events.

MORE THAN ONE AT ONCE

We are not restricted to using one event at a time. As we can determine which event called the code, by examining the accumulator, it is possible to have several events enabled but arrange for each one to cause different action to be taken. Listing 2 illustrates how this can be done. Event 6, an escape key press, is used to toggle page mode on and off, whereas any other key press, event 2, generates a most irritating bleep from the speaker.

Lines 290-310 test to see if the calling event is a key press, and if so, there is a jump to a routine which is the eqivalent of VDU 7, at line 540.

In a similar manner, lines 320-340 test for the escape event. If the event is neither of these, execution drops through to line 350 which causes a jump out of the event handler with no action taken. Since the escape key is being used as a toggle for paging it is necessary to keep a flag which tells us whether paging is currently on, and hence needs switching off, or vice-versa. I have used a zero page location, &73 to hold this. It is initialised to zero in line 170, indi-

CONTINUED OVER

```
 10 REM*KEY BLEEP AND ESCAPE TOGGLE*
 20 MODE 7
 30 code%=&0C00
 40 PROCassemble(code%)
 50 ?&70=?&220:?&221=?&71
 60 ?&220=code% MOD 256:?&221=code% DIV 256
 70 REM*ENABLE ESCAPE EVENT*
 80 *FX14,6
 90 REM*ENABLE KEYBOARD EVENT*
100 *FX14,2
110 REPEAT
120 PRINT"THE ANSWER IS 42"'
130 PRINT"OR PERHAPS A LEMON"'
140 UNTIL FALSE
150
160 DEFPROCassemble(code%)
170 oswrch=&FFEE:?&73=0
180 FOR I%=0 TO 2 STEP 2
190 P%=code%
200 [
210 OPT I%
220 STA &72 \Preserve accumulator
230 PHP
240 PHA
250 TYA
260 PHA
270 TXA
280 PHA
290 LDA &72 \Recover accumulator
300 CMP #2 \Key pressed ?
310 BEQ bleep \If yes jump to bleep routine
320 LDA &72
330 CMP #6 \Is it an escape ?
340 BEQ paging \If yes go to paging routine
350 JMP exit \If neither exit event routine
360
370 .paging
380 LDA &73
390 CMP #&FF \Is paging on or off ?
400 BNE on \If off go to switch on routine
410 LDA #0
420 STA &73
430 LDA #15
440 JSR oswrch \Paging off and reset flag at &73
450 JMP exit
460
470 .on
480 LDA #&FF
490 STA &73
500 LDA #14
510 JSR oswrch \Switch paging on and set flag
520 JMP exit
530
540 .bleep
550 LDA #7
560 JSR oswrch \Make a bleep
570
580 .exit
590 PLA
600 TAX
610 PLA
620 TAY
630 PLA
640 PLP
650 JMP(&70)
660 ]
670 NEXT
680 ENDPROC
```

cating paging off, and contains &FF to indicate paging on. Lines 380-390 interrogate this flag and select the appropriate routines.

If you run the program you will be left with a rapidly scrolling screen of messages. Pressing any key which would return a character will give a bleep and pressing Escape will stop the scrolling at the next page. Shift will cause the usual page change. To leave page mode press escape again and the next time you press shift the rapid scrolling will continue. This type of routine could be used wherever the user might want to display varying lengths of text, say in a word processor, which could sometimes be long enough to need page mode and sometimes not. Without your needing to program it explicitly, page mode is always available from the Escape key.

To leave the program in Listing 2 you will need to press Break, by the way, since one of the effects of enabling the Escape event is to intercept the normal Escape key action in BASIC and this effectively disables the key.

FUTURE EVENTS

Listings 1 and 2, although providing some interesting effects, were written to be clear illustrations of the use of events rather than to be especially useful. In the second part of this series I will be dealing with some event driven routines which can be used to open up all sorts of new capabilities in your Beeb. How would you like to be able to time a game without always having to keep checking the TIME, just set the alarm clock and an event will prod you when time is up ? How do you make your mode 7 screen always have blue characters on a white background, even after a CLS ? All will be revealed next time.

A final comment about the TUBE. You will probably have noticed that there has been quite a bit of highly nefarious direct memory poking going on in this article and so none of the routines will run in the second processor. This is no problem, however, since the second processor cannot deal with events anyway, your event handling code must run in the I/O processor.

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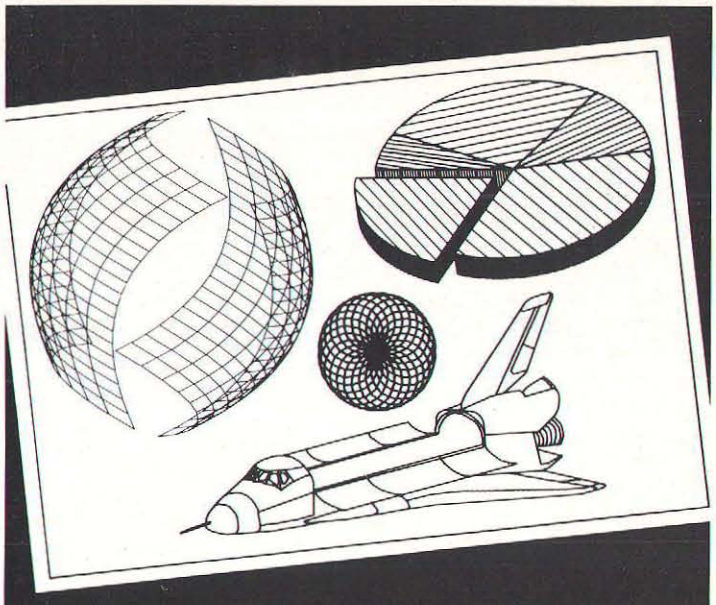

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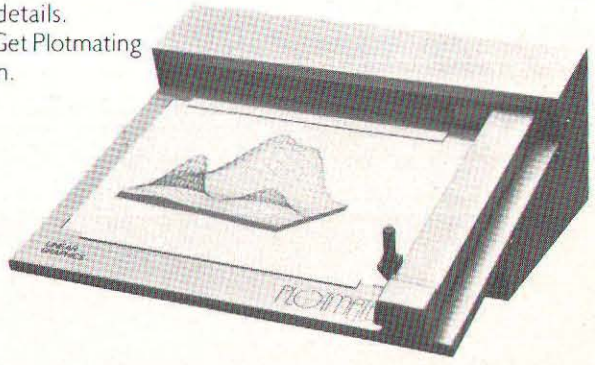

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Mosaic

Frank Wessels

Brings out the creative artist lurking within...simply!

The program consists of two parts, e.g. a pilot program and a main program. I'll explain them both in this order.

The pilot program explains to the user how to use the controling keys and defines VDU-23 characters. After this the main program will be CHAINed.

If the main program is started up, you will see a shape (which represents the cursor) on a blank sheet and a window, which is for communication with the user, not affecting the composition in any way.

You can move the cursor around the screen by using the cursor-keys. If the cursor comes into the upper part of the screen, the window will move to the bottom. If you later enter the bottom part of the screen the window will jump to the top again. This enables the user to draw on the whole screen, while retaining all information before him. You print the shape on the screen by pressing the space bar and the cursor will automatically move one step in the same direction as the last movement. This gives the user the opportunity to draw straight lines easily.

By pressing '<' or '>' the shape on the screen will change its form. If one of the keys 0 — 7 is pressed, the present colour will change to indicated colour given in the window. It is possible to load and save compositions with 'Ctrl L' or 'Ctrl S'. The program asks you for a filename before loading or saving.

The rest of the possibilities are described in the pilot program.

PROGRAM LISTING 1

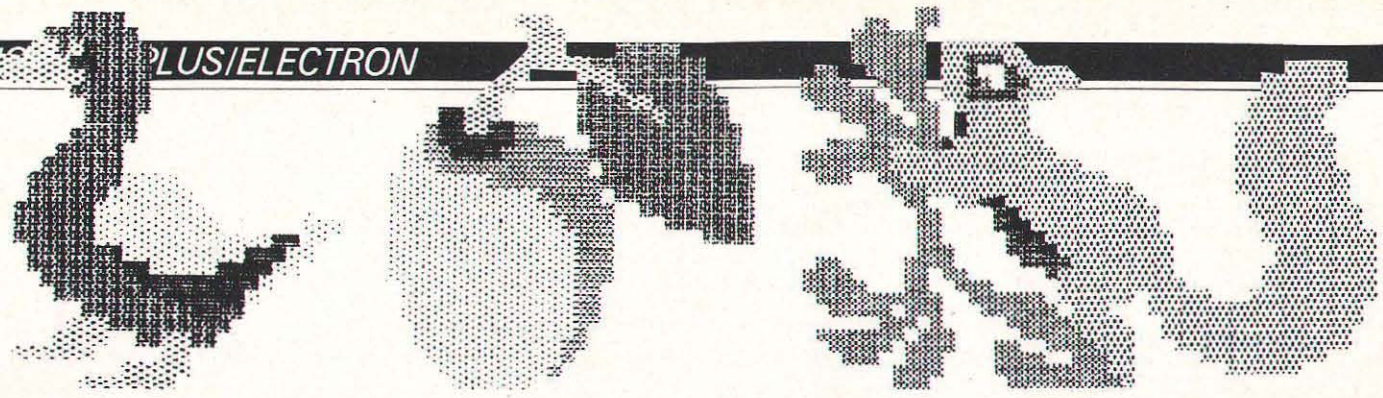
```
  10 REM ************************
  20 REM *    MOSAIC (PART 1)    *
  30 REM *  BY FRANK WESSELS     *
  40 REM * BOUVIGNE 9, 7608 LP  *
  50 REM *  ALMELO, NEDERLAND   *
  70 REM ************************
  80 MODE7
  90 PROCtext
 100 PROCinit
 110 *KEY10PAGE=&1900|MO.|M
 120 CLS:PAGE=&1900
 130 CHAIN"MOSAIC"
 140 END
 150 DEFPROCtext
 160 FOR Y=0TO1
 170   PRINTTAB(12,2+Y)CHR$141;CHR$130"MOSAIC"
 180   PRINTTAB(7,6+Y)CHR$141;CHR$129"BY FRANK WE
SSELS"
 190   NEXT
 200 PRINTTAB(13,4)CHR$151;CHR$96
 210 FOR X=15 TO 19
 220   PRINTTAB(X,4)CHR$96
 230   NEXT
 240 PRINTTAB(8,8)CHR$151;CHR$96
 250 FOR X=10 TO 24
 260   PRINTTAB(X,8)CHR$96
 270   NEXT
 280 PRINT''" This program is based on 'MINISTECK
'."
 290 PRINT'" You  can  design  coloured compositi
onswith MINISTECK by putting little pieces,which d
iffer in colour and  shape, on  agrid."
 300 PRINT'" Press space....";:REPEAT UNTIL GET=3
2
 310 CLS
 320 FOR Y=0TO1
```

```
  330   PRINTTAB(12,0+Y)CHR$141;CHR$130"MOSAIC"
  340   PRINTTAB(0,3+Y)CHR$141;CHR$129"INSTRUCTION
S :"
  350   NEXT
  360 PRINTTAB(13,2)CHR$151;CHR$96
  370 FOR X=15 TO 19
  380   PRINTTAB(X,2)CHR$96
  390   NEXT
  400 PRINTTAB(0,6)CHR$151;CHR$96
  410 FOR X=2 TO 39
  420   PRINTTAB(X,6)CHR$96
  430   NEXT
  440 PRINTTAB(0,7)CHR$134"Cursor keys : Move curs
or,"
  450 PRINTCHR$134"Space bar    : Prints shape,"
  460 PRINTCHR$134"0 - 7        : Determine colour,
"
  470 PRINTCHR$134", or <       : Change shape,"
  480 PRINTCHR$134". or >       : Change shape,"
  490 PRINTCHR$134"C            : Clears screen,"
  500 PRINTCHR$134"V            : Views composition
,"
  510 PRINTCHR$134"Ctrl L       : Loads composition
,"
  520 PRINTCHR$134"Ctrl S       : Saves composition
,"
  530 PRINTCHR$134"Ctrl Q       : Quits program."
  540 PRINTTAB(0,17)CHR$151;CHR$44:FORX=2 TO 39:PR
INTTAB(X,17)CHR$44:NEXT
  550 PRINTTAB(0,18)" Speed of the cursor :"
  560 PRINT" 1 Key hit  : speed one,"
  570 PRINT" 2 Key hits : speed two."
  580 PRINT'" Press space to load mainprogram.";
  590 REPEAT UNTIL GET=32
  600 ENDPROC
  610 DEFPROCinit
  620 VDU23,224,0,0,16,16,48,48,0,0
  630 VDU23,225,0,0,16,16,24,24,0,0
  640 VDU23,226,0,0,0,0,24,24,16,16
  650 VDU23,227,0,0,0,0,48,48,16,16
  660 VDU23,228,0,0,24,24,24,24,0,0
  670 VDU23,229,0,0,0,0,16,16,0,0
  680 VDU23,230,0,0,0,0,56,56,0,0
  690 VDU23,231,0,0,0,0,24,24,0,0
  700 VDU23,232,0,0,16,16,16,16,16,16,
  710 VDU23,233,0,0,16,16,16,16,0,0,0
  720 VDU23,234,255,255,255,255,255,255,255,255
  730 VDU23,235,255,129,129,129,129,129,129,255
  740 ENDPROC
```

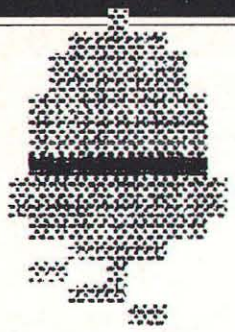
PROGRAM LISTING 2

```
   10REM ********************
   20REM *  MOSAIC (PART 2)  *
   30REM * BY FRANK WESSELS  *
   40REM * SAVE THIS PROGRAM *
   50REM *    AS "MOSAIC"    *
   60REM ********************
   70MODE2
   80PROCinit
   90ON ERROR PROCrecover
  100IF ER THEN PROCerrormessage
  110:
  120REM *************
  130REM * MAIN loop *
  140REM *************
  150:
  160REPEAT
  170IF AU THEN PROCmove2:UNTIL FALSE
  180*FX15,0
  190K%=GET
  200IF K%>135 AND K%<140 THEN S%=8:AU=FALSE:K1%=K
%:PROCmove
  210IF K%>47 AND K%<56 THEN PROCcolour
  220IF K%=44 OR K%=60 THEN PROCchangeshape1
  230IF K%=46 OR K%=62 THEN PROCchangeshape2
  240IF K%=32 THEN PROCprintshape
  250IF K%=86 THEN PROCview
  260IF K%=67 THEN PROCcls
  270IF K%=19 THEN PROCsaveorload(0)
  280IF K%=12 THEN PROCsaveorload(&FF)
  290UNTIL K%=17
  300MODE7
  310PRINT"Bye..."
  320PROCrecover
  330END
  340:
  350REM **************
  360REM * PROCEDURES *
  370REM **************
  380:
  390DEFPROCinit
  400VDU 23;8202;0;0;0;
  410PROCassem
  420A%=&30:X%=&0
  430CALL begin
  440CLS
  450PROCwindow
  460VDU 19,15,7,0,0,0,19,14,2,0,0,0,19,12,4,0,0,0
,19,10,6,0,0,0
  470*FX4,1
  480*FX11,20
  490*FX12,1
  500R%=1:X=500:Y=504:C%=0:S%=8:A%=&98:X%=&0:K1%=1
39:T%=224
  510AU=FALSE:ER=FALSE:ED=FALSE
  520VDU5
  530GCOL4,0
  540PROCcursor
  550ENDPROC
  560:
  570DEFPROCassem
  580DIM room 65
  590coun=&74
  600coun2=&75
  610Y%=0
  620FOR T=0 TO 2 STEP 2
  630P%=room
  640; OPT T
  650.begin  STA &71
  660        STX &70
  670        LDA #&0
  680        STA &72
  690        LDA #&11
  700        STA &73
  710        LDA #0
  720        STA &74
```

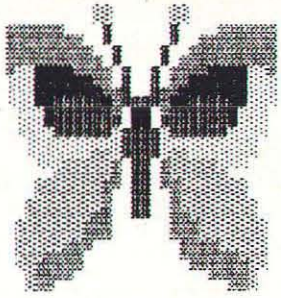
CONTINUED OVER



```
 730         STA &75
 740.loop    JSR wissel
 750         LDX &71
 760         INX
 770         STX &71
 780         LDX &73
 790         INX
 800         STX &73
 810         LDX coun
 820         INX
 830         STX coun
 840         CPX ¾7
 850         BNE loop
 860         LDX ¾&80
 870         STX coun2
 880         JSR wissel
 890         RTS
 900.wissel  LDA (&70),Y
 910         TAX
 920         LDA (&72),Y
 930         STA (&70),Y
 940         TXA
 950         STA (&72),Y
 960         INY
 970         CPY coun2
 980         BNE wissel
 990         RTS
1000¿
1010NEXT
1020ENDPROC
1030:
1040DEFPROCcursor
1050MOVEX,Y
1060VDU T%
1070ENDPROC
1080:
1090DEFPROCcolour
1100VDU4
1110C%=K%-48
1120IF C%=2 THEN C%=14
1130IF C%=4 THEN C%=12
1140IF C%=6 THEN C%=10
1150IF C%=7 THEN C%=15
1160COLOUR C%
1170IF C%<>0 VDU31,8,R%:VDU234 ELSE COLOUR15:VDU3
1,8,R%:VDU235:COLOURC%
1180VDU5
1190ENDPROC
1200:
1210DEFPROCwindow
1220COLOUR15
1230PRINTTAB(1,1)"COLOUR=";:VDU235
1240COLOUR135
1250COLOUR0
1260PRINTTAB(11,1)"0"
1270COLOUR128
1280FOR counter=1 TO 7
1290COLOUR counter
1300PRINTTAB(11+counter,1);counter
1310NEXT
1320GCOL0,1:MOVE20,1020:DRAW1259,1020:DRAW1259,93
4:DRAW20,934:DRAW20,1020
1330GCOL0,2:MOVE35,1015:DRAW1245,1015:DRAW1245,94
0:DRAW35,940:DRAW35,1015
1340GCOL4,0
1350ENDPROC
1360:
1370DEFPROCchangeshape1
1380PROCcursor
1390IF T%<>224 THEN T%=T%-1 ELSE T%=233
1400PROCcursor
1410ENDPROC
1420:
1430DEFPROCchangeshape2
1440PROCcursor
1450IF T%<>233 THEN T%=T%+1 ELSE T%=224
1460PROCcursor
1470ENDPROC
1480:
1490DEFPROCcls
1500IF R%=1 THEN A%=&30:X%=&0 ELSE A%=&78:X%=&80
1510CALL begin
1520CLG
1530CALL begin
1540PROCcursor
1550A%=&98
1560X%=&0
1570ENDPROC
1580:
1590DEFPROCview
1600IF R%=1 THEN A%=&30:X%=&0:CALL begin
1610IF R%=30 THEN A%=&78:X%=&80:CALL begin
1620PROCcursor
1630REPEAT UNTIL GET
1640PROCcursor
1650CALL begin
1660A%=&98
1670X%=&0
1680ENDPROC
1690:
1700DEFPROCprintshape
1710PROCcursor
1720GCOL0,C%
1730MOVEX,Y
1740VDU T%
1750GCOL4,0
1760IF K1%=136 THEN IF X-S%>-28 THEN X=X-S%:PROCc
ursor:ENDPROC
1770IF K1%=137 THEN IF X+S%<1258 THEN X=X+S%:PROC
cursor:ENDPROC
1780IF K1%=138 THEN IF Y-S%>10 THEN Y=Y-S%:PROCcu
rsor:PROCcontroldown:IF ED THEN ENDPROC
1790IF K1%=139 THEN IF Y+S%<1036 THEN Y=Y+S%:PROC
cursor:PROCcontrolup:IF ED THEN ENDPROC
1800PROCcursor
1810ENDPROC
1820DEFPROCdrawdown
1830IF Y-S%>10 THEN PROCcursor:Y=Y-S%:PROCcursor
1840IF Y<300 AND R%=30 THEN A%=&78:X%=&80:CALL be
gin:A%=&30:X%=&0:CALL begin:R%=1:A%=&98:X%=0
1850ENDPROC
1860:
1870DEFPROCdrawup
1880IF Y+S%<1036 THEN PROCcursor:Y=Y+S%:PROCcurso
r
1890IF Y>750 AND R%=1 THEN A%=&30:X%=&0:CALL begi
n:A%=&78:X%=&80:CALL begin:R%=30:A%=&98:X%=0
1900ENDPROC
1910:
1920DEFPROCrecover
```



-COMPUTER



```
 1930IF ERR=214 OR ERR=198 OR ERR=195 THEN ER=TRUE
:ENDPROC
 1940*FX4
 1950*FX11,20
 1960*FX12,5
 1970VDU4
 1980IF K%=17 THEN END
 1990IF ERR<>17 THEN REPORT:PRINT;" at line ";ERL
 2000END
 2010ENDPROC
 2020:
 2030DEFPROCmove
 2040*FX15,0
 2050TIME=0
 2060REPEAT
 2070T=TIME
 2080W%=INKEY(1)
 2090UNTIL W%<>-1 OR T>30
 2100IFT>15 AND T<30 AND W%<>-1 THEN S%=8:AU=TRUE:
W%=-1
 2110IFT<15 AND W%<>-1 THEN S%=24:AU=TRUE:W%=-1
 2120PROCdraw
 2130ENDPROC
 2140:
 2150DEFPROCusr
 2160IF USR(&FFF4) AND &01000000 THEN AU=FALSE
 2170ENDPROC
 2180:
 2190DEFPROCdraw
 2200*FX15,0
 2210IF K%=136 THEN IF X-S%>-28 THEN PROCcursor:X=
X-S%:PROCcursor
 2220IF K%=137 THEN IF X+S%<1258 THEN PROCcursor:X
=X+S%:PROCcursor
 2230IF K%=138 THEN PROCdrawdown
 2240IF K%=139 THEN PROCdrawup
 2250ENDPROC
 2260:
 2270DEFPROCmove2
 2280IF AU THEN PROCusr
 2290IF AU THEN PROCdraw:ENDPROC
 2300AU=FALSE
 2310ENDPROC
 2320:
 2330DEFPROCsaveorload(ACC)
 2340VDU4
 2350IF R%=1 THEN VDU28,0,2,19,0 ELSE VDU28,0,31,1
9,29
 2360CLS
 2370COLOUR6
 2380REPEAT
 2390PRINTTAB(0,1)"No qoutes needed"
 2400PRINTTAB(0,2)"Max. 7 letters.";
 2410PRINTTAB(11,0)"          ";
 2420INPUTTAB(0,0)"Filename = "F$
 2430IF LEN(F$)>7 THEN VDU7
 2440UNTIL LEN(F$)<8
 2450FORJ%=&18A0 TO &18BF
 2460?J%=0
 2470NEXT
 2480FORJ%=&18C0 TO &18D0
 2490?J%=&0D
 2500NEXT
 2510L%=&18A0
 2520$(&18C0)=F$
 2530?L%=&C0
 2540L%?1=&18
 2550L%?2=&0:L%?3=&30
 2560L%?&A=&0:L%?&B=&30
 2570L%?&E=&FF:L%?&F=&7F
 2580CLS
 2590PRINTTAB(0,1)"Press space to ";:IF ACC=0 THEN
PRINT"save" ELSE PRINT"load"
 2600PRINTTAB(0,2)"the composition.";
 2610REPEAT UNTIL GET=32
 2620CLS
 2630IF ACC=&0 THEN PRINTTAB(0,0)"TAPE : Record th
en":PRINTTAB(0,1)"RETURN twice !!!!":PRINTTAB(0,2)
"DISC : RETURN.";:REPEAT UNTIL GET=13:CLS
 2640IF R%=1 THEN A%=&30:X%=0 ELSE A%=&78:X%=&80
 2650CALL begin
 2660VDU5
 2670PROCcursor
 2680VDU21
 2690A%=ACC:X%=&A0:Y%=&18
 2700CALL &FFDD
 2710VDU6
 2720X=500:Y=504
 2730PROCcursor
 2740VDU4
 2750R%=1:A%=&30:X%=&0
 2760CALL begin
 2770C%=0
 2780VDU26
 2790PROCwindow
 2800A%=&98:X%=&0:Y%=&0
 2810VDU5:ENDPROC
 2820:
 2830DEFPROCcontroldown
 2840ED=FALSE
 2850IF Y<300 AND R%=30 THEN A%=&78:X%=&80:CALL be
gin:A%=&30:X%=&0:CALL begin:R%=1:A%=&98:X%=0:ED=TR
UE:ENDPROC ELSE ED=TRUE:ENDPROC
 2860ENDPROC
 2870:
 2880DEFPROCcontrolup
 2890ED=FALSE
 2900IF Y>700 AND R%=1 THEN A%=&30:X%=&0:CALL begi
n:A%=&78:X%=&80:CALL begin:R%=30:A%=&98:X%=0:ED=TR
UE:ENDPROC ELSE ED=TRUE:ENDPROC
 2910ENDPROC
 2920:
 2930DEFPROCerrormessage
 2940VDU6
 2950X=500:Y=504
 2960VDU5
 2970PROCcursor
 2980VDU4
 2990R%=1:A%=&30:X%=&0
 3000CALL begin
 3010VDU28,0,2,19,0
 3020CLS
 3030COLOUR15
 3040VDU31,0,0
 3050REPORT
 3060PRINTTAB(0,2)"Press space....";
 3070REPEAT UNTIL GET=32
 3080CLS
 3090C%=0
 3100PROCwindow
 3110A%=&98:X%=&0:Y%=&0
 3120VDU5
 3130VDU26
 3140ENDPROC
```

Creative Sound

```
%6I4E7I2CCCC
6I4E7I2CCCC
6I4E7I2CCCCR
%6I4E7I2CCCCR
6I4E8/.
1222 Bytes, 80 Bars

Top of data: &49F9

Press SPACE BAR to begin
```

The music compiler working its way through MCL data.

Creative Sound by Hybrid Technology's Chris Jordan and Music/Micro correspondent David Ellis is the latest in a long line of interesting musical releases for the BBC Microcomputer in the last 6 months.

In this book and book/disc/cassette package, we get the synthesis of Chris Jordan's expertise with the BBC (he designed the SOUND and ENVELOPE statements for the BBC and Hybrid produce the Music 500) and the writing and musical skills of David Ellis, well known for his columns in the music and computer press.

The style is chatty and humourous which helps break up the technical aspects. Some of the content is fairly demanding of the reader, especially without previous contact with either the music or microcomputer world.

If you want to know about the antecedants to the current technology, you will find an enthusiastic history at the start of Creative Sound. And if you want to catch up on the latest in synthesiser/microcomputer combinations and the quite close links between the two, then the authors are just the people to keep you up to date.

Creative Sound is based on the BBC Microcomputer and the book is packed with listings, ranging from one line of SOUND statement to eight pages of synthesiser, or music compiler. The authors do well to avoid the constant repeats of the User Guide on SOUND and ENVELOPE but satisfy our curiosity with constructive examples. There is as much to see on screen in the way of Fourier synthesis and SOUND and ENVELOPE demonstrations (very nicely programmed and presented) as there is music to listen to. The text has plenty of diagrams and screen shots and information on program use.

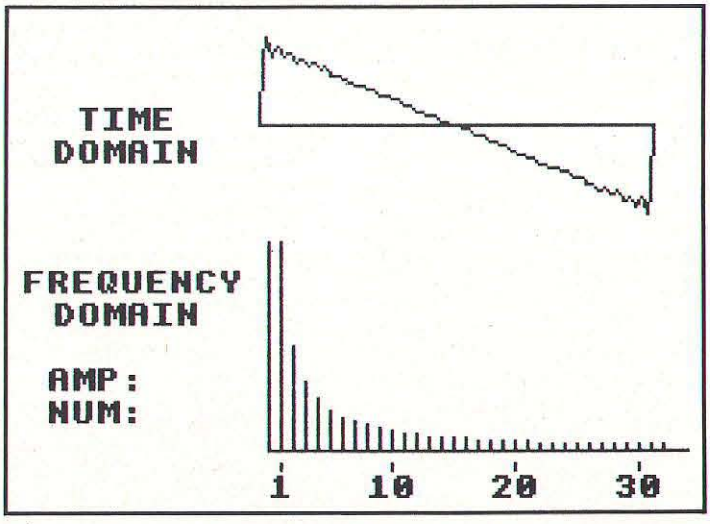
The authors' interest in music rather than noise is demonstrated by a very short acknowledgement of games noises and sound effects. From there it's on to real time music, a mini studio for record, edit and playback, a preset, programmable and echo synthesiser and a programmable sequencer.

The two main chapters of interest to already accomplished micro musicians will be those on composing by computer and composing with the assistance of the computer. Mozart's musical dice game with which he composed waltzes is reproduced for the micro. It makes fascinating listening and is followed by investigations into minor chords and fractal tune generation. Composing by statistics always seems a bit cold and the authors appropriately fill in the academic background to work in this field. You'll be delighted to know that this chapter closes with a program for composing coloured music and the self-fulfilling Muse.

The computer assisted composition revolves around the idea of a MCL (Music Composition Language). From an earlier music interpreter and forays into Canons and Phase Music (which necessitates some complex reconfiguring of the O.S. sound software), emerges a music compiler. An easy to use combination of keyboard characters form the composition codes (AMPLE programmers will be on familiar ground) which are compiled into an efficient (two byte per note) intermediate code for interpretation and playing.

The music, original or copied from sheet music, is entered into DATA statements and can easily be *EXECed onto the end of the main program. Various examples are provided, from Bach to the ear piercing Continuum by contemporary Hungarian composer, Gyorgi Ligeti. The compiler is not just a digital jukebox however. It forms with the rest of the programs in Creative Sound a formidable musical toolbox for the experimenter. The programming is to a high standard in its own right and not just throwaway illustration of the text content.

Fourier Synthesis plotting away.



The authors finish off Creative Sound with the least creative section but nevertheless a useful look at musical education software aids. Taking their cue once again from the superpower examples from America, the authors produce some humble BASIC listings for pitch training, pitch tuning, interval drill, keyspinner (minor or major keys?), key confuser, scale recognition and rhythm drill. All should prove useful to the teacher of music or the individual inspired to gain some conventional music skills at the same time as working on his first AMPLE concerto!

For anyone already bitten by the music bug Creative Sound is essential reading and programming. For anyone teetering on the brink, £9.95 is not a lot to pay for a good informative read, some valuable programs and music to show off with! If you enjoy the luxury of being more into music than programming then the £17.95 (book plus cassette) or £19.95 (book plus discs) is a worthwhile investment, just so that you can get your hands on the working programs that much quicker.

An early pioneer of computer music, Max Mathews, is quoted in Creative Sound: "Computers will add a new dimension to music, especially the home computer. It will be sufficiently easier to play that many people who otherwise could only listen to music will become active musicians. This may be the biggest accomplishment of the home computer market." Dave Ellis and Chris Jordan are doing their bit to make this prediction come true.

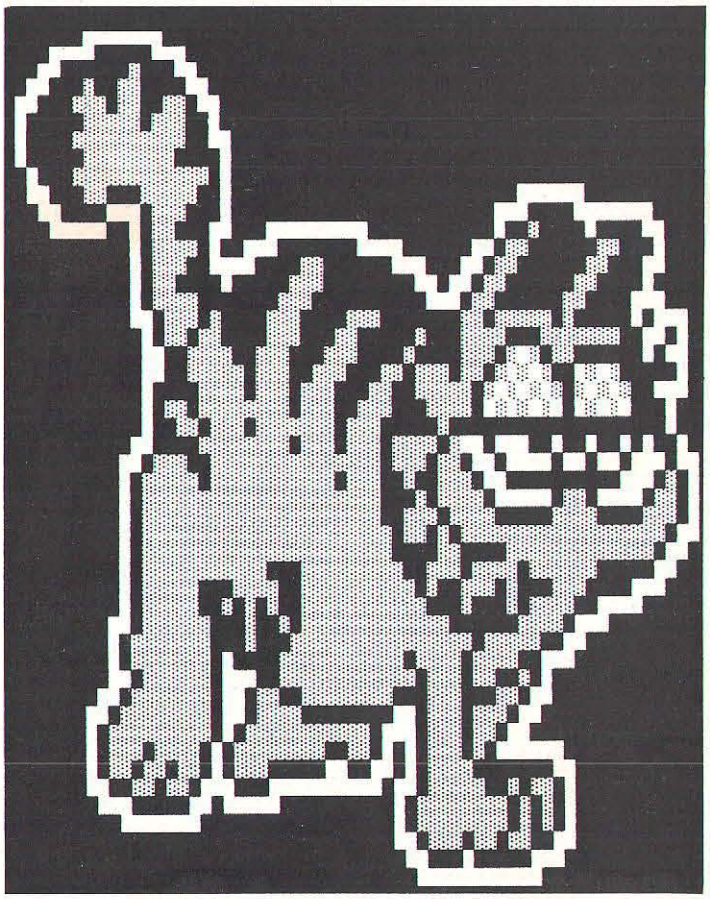
Greater Graphics

Mark Webb

The Acornsoft Graphics Extension ROM, launched at the Acorn User Show, will cost £29.95, a very reasonable price for the "official" extension to the BBC Microcomputer Machine Operating System 1.2.

As well as the 16K ROM, the package features a User Guide containing valuable technical information and a number of example applications of the graphics extensions. These examples and a set of larger programs, including an icon based drawing package, are supplied on a cassette tape. Automatic transfer to disc is catered for.

A host of new PLOT commands for fast drawing and filling operations and a full sprite editing/plotting package are the main features.



When, having installed your new Graphics Extension ROM, you type *HELP, the "Graphics Extension 1.2" is accompanied by two subheadings, "Graphics" and "Sprites". Separate *HELPs give you the information illustrated, so rereads of the manual are kept to a minimum.

Moving to the manual you will find that these two parts of the Graphics Extension ROM are indeed quite separate subjects, although both make use of extensions to the VDU commands and of new *commands in the ROM. The extended VDU commands can be called from any user program in any language supporting graphics. The *commands are used to turn features on and off within Graphics Extension ROM and to reserve user memory for them.

GRAPHICS EXTENSION ROM SLOTTING IN

There are a few points to clear up about Graphics Extension ROM. The 1.2 version number reflects the fact that the Graphics Extension ROM requires 1.2 Operating System to work. In order to achieve the high speed of a plotter the interface to the operating system is very tight.

On seeing the demonstration programs, one of the first things you think is: "that's writing directly to the screen". The "official" status of the Graphics Extension ROM as well as the practical considerations, well justify this method of upgrading the O.S.

The GFX is compatible with the Aries B-20 shadow memory board. A special version will become available for the BBC Plus. Graphics Extension ROM is second processor compatible (I can confirm 6502 and Z80 but not 32016). As a service ROM it sits in the I/O processor when the second processor takes over. This means that there are no memory overheads for second processor users.

Clashing with other ROMs is a known hazard of any new ROM product these days. Giving Graphics Extension ROM highest priority will solve the problem if any occurs. Some ROMs, notably Wordwise Plus, use *FX163 without a restrictive range of parameters, thus bumping into other ROMs which use their allocated parameters (0-66 with Graphics Extension ROM). Graphics Extension ROM must therefore be placed higher than Wordwise Plus.

Graphics Extension ROM itself might affect any program using workspace below the default value of PAGE so a *NOGXR command is provided to turn it off.

ALL SHAPES AND SIZES

The new PLOT commands fill in the gaps which have always been "reserved for extension". Three still remain unfilled because there was no useful feature that the designers felt they could still incorporate.

***GXR** gets you going if not already turned on. "Press the BREAK key" is prompted as the Graphics Extension ROM resets PAGE three pages of workspace higher. Two of these are for the flood fill, so a *NOFLOOD is supplied for their retrieval. There is no *BREAK command for simulating a break as with the AMX mouse ROM.

Rectangles and squares are plotted and filled with values &60 to &67. You MOVE to the start point and PLOT top or bottom left hand corner, top or bottom right hand corner. That's all there is to it. You soon realise that the fantastic thing about the Graphics Extension ROM is that so many features are available in the familiar forms of BBC BASIC.

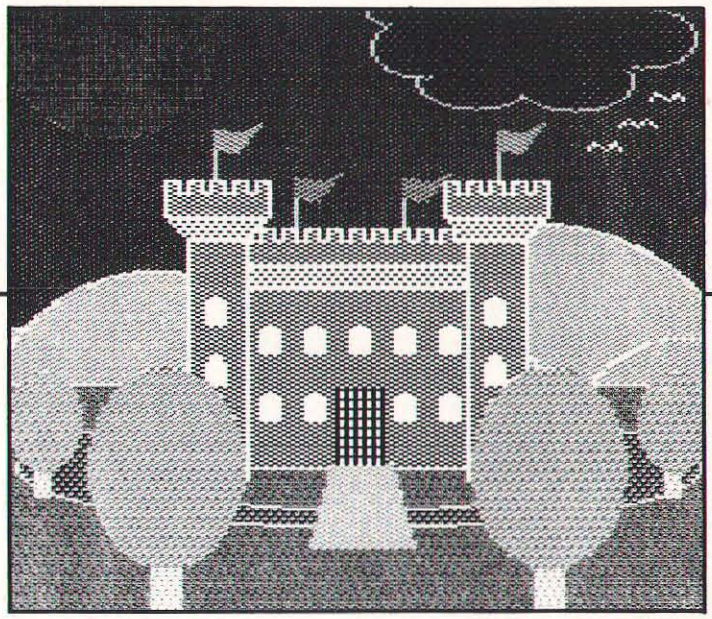
Anyone who has had a go at defining characters will have no trouble at all in understanding what is going on in the sprite editor or the principles behind defining patterns and colour mixes. The PLOT commands are equally straightforward to use and the syntax required comes naturally to the BASIC graphics tinkerer. Nor is it necessary to sit down and calculate the hexadecimal value of a line of interlaced bits to determine a single line of Mode 2 colour shading, or whatever. The utility programs supplied take out all the hard work.

The one area perhaps in which you need to learn a bit of technique is in the implementation of sprites. Some methods are better than others and the manual and demonstrations make the plus and minus points clear. Once again however, anyone who has used the GCOL command will have no difficulty understanding what is going on.

FURTHER EXTENSIONS

The rectangle plot was easy, how about a parallelogram? PLOT codes &70 to &77 do the trick. Parallelograms need two MOVE commands followed by the PLOT to determine the eventual screen

CONTINUED OVER



position of the shape.

Circle fills – PLOT &98 to &9F – are very quick, both in drawing and coding. Just MOVE to the centre and specify a point on the circumference. You can do the latter relatively or absolutely, as you wish. Further codes – &90 to &97 PLOT circle outlines. Ellipses – PLOT&C5 to &C7 for outlines and &C8 – &CF for fills – require three points to be specified, like parallelograms, ie two MOVEs and a PLOT.

Arcs – &A0 to &A7 – and sectors – &B0 to &B7 – also require three X,Y points. Both are drawn in an anti-clockwise direction.

Segments of circles are also catered for – PLOT &A8 to &AF. The Acorn example uses these. The final PLOT command is sprite related. When you have *SCHOOSEd (*SCHOSEn?) your sprite number, it is PLOTted in various fashions by the range of code &E8 – &EF. The PLOT code is followed, as always, by the x,y coordinates, eg PLOT&ED,310,820.

MIX AND MATCH

In addition to all these new shapes and sizes, the Graphics Extension ROM provides the means to define a host of patterns, colour mixes and line styles for the PLOT commands to work with.

The colour mixes depend on which Mode you are in and therefore how many colours you have available. To get you started there are four predefined default patterns in each graphics Mode. They are used with GCOL16,0; GCOL32,0;GCOL48,0;GCOL64,0. The second parameter determines whether the mix is to be foreground (0-127) or background (128-255) colour.

You only have four mixes for fills and line plotting at any one time but of course you can go on redefining within a program for more combinations as long as you wish.

The GCOL statements above correspond to the VDU23,(25),n,n,n,n,n,n,n,n statements which define the exact pixel by pixel make up of the mix. The user guide explains how pixel colours are defined in different Modes and the Editor utility program saves you from toiling over the intricasies of screen display.

Lines can also be drawn in these colour patterns, though without quite the stunning effect of fills. The dot/dash PLOT patterns can also be redefined. This aspect of Graphics Extension ROM is nicely demonstrated by an animated water fountain on the dealer demonstration disc. Certain colour combinations work well and experimentation will be rewarded. It is possible to define an orange mix for instance which looks pretty solid even on a high resolution monitor. Simple cross hatching can be defined by providing a number, 1-8, in the appropriate VDU statement parameter.

FLOODING, CUTTING AND PASTING

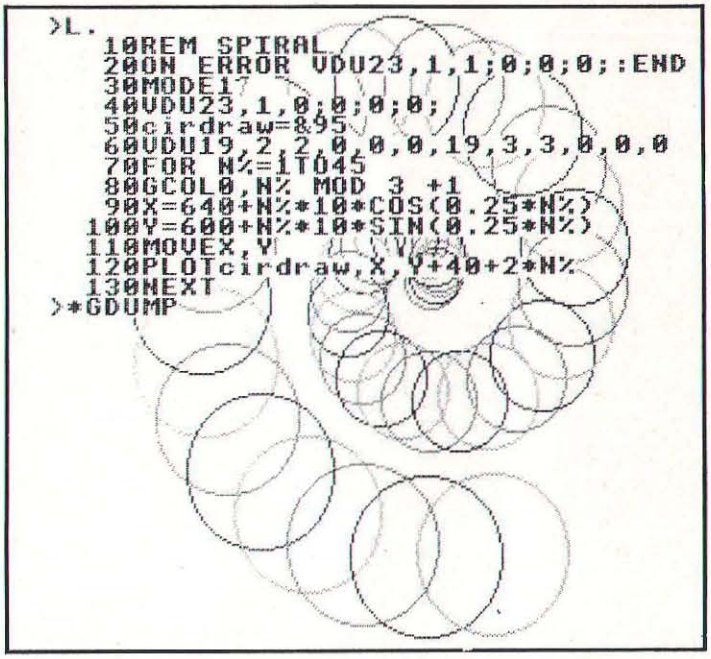
Filling a shape has never been the easiest thing to do with the BBC's PLOT facilities although many algorithms and routines have appeared in books and magazines. The sideways fills are a bit slow and not intelligent enough to deal with irregular shapes. Now we've gone right the other way with some amazing flood fills.

The flood fill PLOTs in the Graphics Extension ROM are probably its most impressive feature, but its most expensive in terms of memory. *FLOOD and *NOFLOOD turn the facility on and off.

Two types of flood fill are available. PLOTs &80 – &87 implement flood to non-background colour. In other words, keep on filling in the gaps in background colour until totally enclosed by colours other than background colour.

The second version is flood until foreground. Or keep filling in until completely surrounded by the same foreground colour as you are filling in. For instance, a white flood covering everything inside a shape whose borders are drawn in white. Flood fills really come into their own when dealing with irregular shapes and are worth every byte of space they take up.

Well now we've coloured in the screen display, how about a bit of cut and paste? The Graphics



```
>L.
  10REM SPIRAL
  20ON ERROR VDU23,1,1;0;0;0;:END
  30MODE1
  40VDU23,1,0;0;0;0;
  50cirdraw=&95
  60VDU19,2,2,0,0,0,19,3,3,0,0,0
  70FOR N%=1TO45
  80GCOL0,N% MOD 3 +1
  90X=640+N%*10*COS(0.25*N%)
 100Y=600+N%*10*SIN(0.25*N%)
 110MOVEX,Y
 120PLOTcirdraw,X,Y+40+2*N%
 130NEXT
>*GDUMP
```

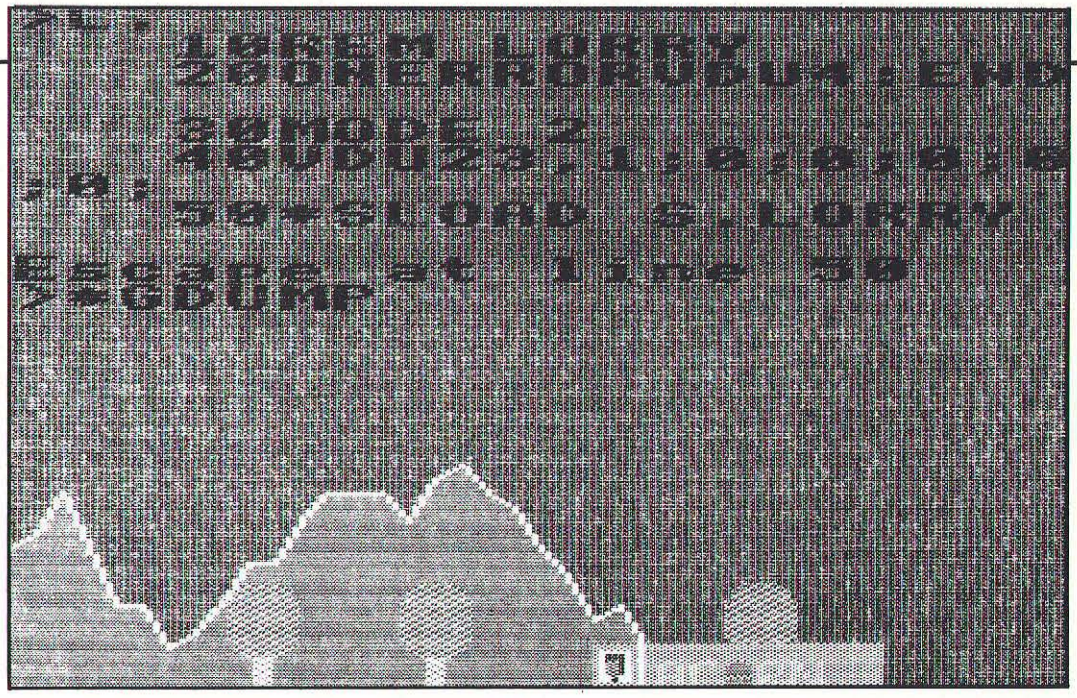
Extension ROM Plots &B8 to &BF allow you to mark a rectangualr area and to move a copy anywhere on screen. You can leave the original in place or you can replace it with a block of background colour. These PLOTs can be easily incorporated into an art package and sliding block puzzles will no doubt become common place.

SPRITES

The Graphics Extension ROM sprites package is the answer to every BASIC games programmer's dream. If the Graphics Extension ROM becomes a standard chip in most machines around the country then there will be a whole new flood of amateur games being swapped and played and rejigged, and swapped again.

There have been a couple of excellent sprite packages for the BBC but the Graphics Extension ROM version has the advantage of being in ROM and in using a simple PLOT X,Y command to position the sprites. Sprites are also greedy for memory. You grab space with *SSPACE *number of pages*. It all depends on how many and how big.

All the definition, the filling in of pixels, the choice of size and colours, is done in the Editor. This is a sophisticated designer, well designed itself, in the way it displays the sprite and in the single key press facilities it offers, including penup and pendown. You can insert and delete columns and rows, flood them with colour,



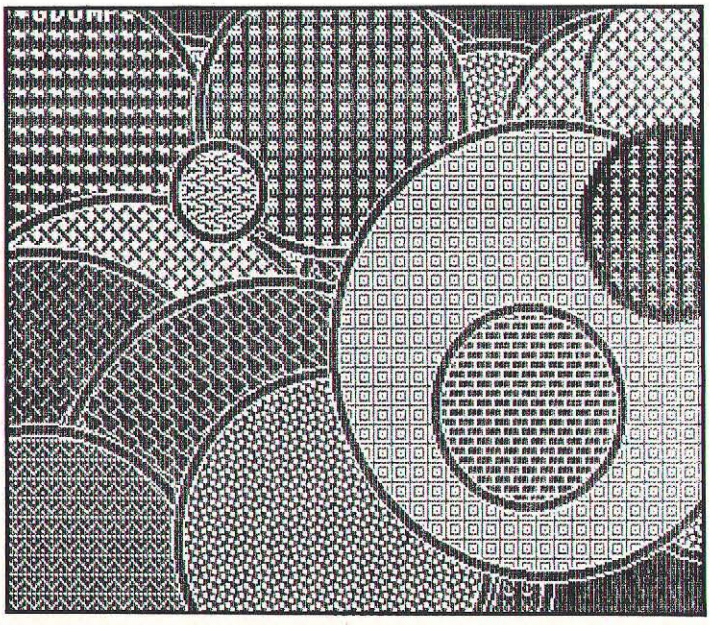
extend them, mirror them horizontally and vertically — essential for quick redefinition of masks and for sprites which have to be seen travelling in various directions.

Each sprite has a number between 1 and 255. The management of the sprite library is left up to you! The memory holding the definitions is *SSAVEd, SLOADed or SMERGEd to and from cassette or disc. The Editor is used to create and alter any sprite and is entered with *SEDIT *sprite number*. *SEDIT *n,m* lets you edit an already existing definition, say a goblin facing left, to edit it, say vertical mirror, a new set of pointed ears, and then to save it as sprite 2, goblin facing right.

As already described, *SCHOOSE followed by PLOT &E8 — &EF, X,Y draws your goblin or Garfield (as seen in the demos) on the screen. Movement is achieved by manipulating the values of X and Y.

For greater flexibility with a BASIC program VDU23,27,sprite number,0,0,0,0,0,0 can be used in place of *SCHOOSE. The sprite number can then be a variable quantity within a FOR...NEXT loop for instance, or depending on a flag, set up, down, left or right.

One minor complication occurs if you are using graphic windows. Although the Graphics Extension ROM handles the movements of sprites on and off the screen for you, it is necessary to use graphics windows which are "byte aligned" — a whole number of bytes from the screen edge, if this is to work properly. Of the edge is offset from a byte boundary, the sprite will overlap the edge of the window before disapearing. Finally, there is a rather fascinating method of defining a sprite with *SGET *sprite number*. This feature is also implemented on the new Commodore 128 I am told!



Say you wanted to reproduce a favourite character in your own game. First you load the screen containing the character, then you define the rectangle containing it — just like rectangle drawing. Then you *SGET or VDU23,27,1,sprite number,0,0,0,0,0,0 and pick up the rectangle and put it into the relevant sprite definition for plotting and editing. This can be great fun with well-known games and pictures.

NEW STANDARD

Graphics Extension ROM isan impressive all-rounder. The PLOT and VDU extensions are very easy to use and the results pretty stunning, compared with the standard BBC and other machines. The sprite operation is also very friendly as far as editing goes but truly impressive results depend on use (the manual is very helpful and the examples instructive). Don't expect to produce a Frak! or a Blagger at your first attempt. It's worth remembering that, even if we had access to the routines which produce such games, most of us couldn't make head nor tail of them. Graphics Extension ROM sprites are more amenable and there is no reason why they shouldn't be used in association with assembler for even better performance.

"Official" or not, a product has to justify a £30 price tag. The Graphics Extension ROM is genuinely valuable with new commands to send your graphics into overdrive. The plots and fills are very fast but come packaged in familiar BBC BASIC forms. The documentation is sound, the demonstrations numerous (apparently Acornsoft is swimming in discs with examples on).

The support is likely to be huge and so programs will be written to use the extended system. Some very ordinary looking BASIC programs are going to find themselves retrieved from the disc or cassette box for rejuvenation with Graphics Extension ROM.

The sprites may not be up to producing commercial arcade games but will prove very useful to any programmer who wants to concentrate efforts on aspects (educational perhaps) other than screen display. Graphics Extension ROM sprites will perform to order.

Any programmer, any end user, knows the importance of attractive screen displays. At the price, Acornsoft have given us all the chance of standardising on a new level of display for BBC BASIC programs. Hands up all those with a spare ROM socket.

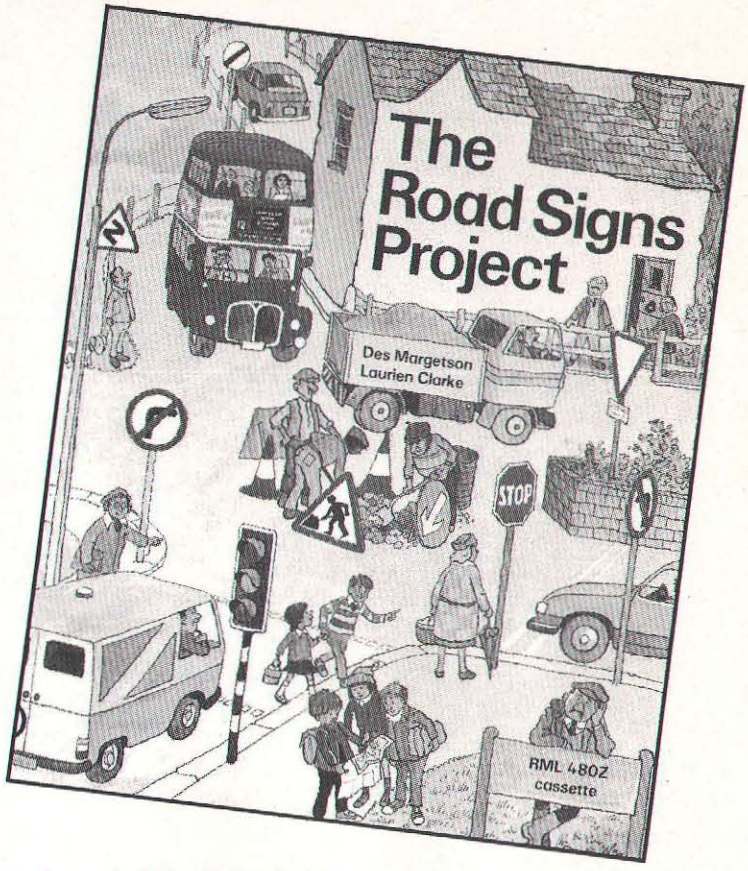
BBC Road Safety

Des Thomas

Road Safety and the Micro.

"Our children have much to fear from man's inventiveness, for such is the pace of modern technological development that they have constantly to adapt to new situations at home, at school and, most of all on the roads, where they are subjected to more and greater risks than ever before. In modern society the traffic accident has replaced malnutrition and disease as the biggest single threat to young life and limb.... What makes this continuous waste of human life even more shocking is that so many road tragedies could be prevented. Analysis reveals that human error is a major factor in almost every accident and while engineering improvements in car and road design help to ensure that such errors become less likely to lead to accident and injury, it is education which offers the surest method of reducing the incidence of errors themselves."

"Children and Traffic – Road Safety Education Project", Macmillan Education.



If you've stood outside a school at the end of the afternoon session, you might question the last statement. Forget the children for a moment and look at the adults who have all been through the system – the ice cream vendor parked as near as he can to the school entrance; parents gossiping and blocking the pavement with prams so that the children have to step into the road to pass; the toddlers playing in the gutter; the double parking; parents throwing open the rear offside door and beckoning to the infant poised on the opposite kerb or turning their cars in the school gateway and waiting in the area clearly marked SCHOOL ENTRANCE for a quick getaway.

What about the planners who designed the school with only one entrance/exit for use by cars, delivery lorries and children; and, of course, there are the children themselves! Not unnaturally, the most commonly used teaching method is teaching by example, but it's obvious from the above – and I don't think that the area outside my school gates is any better or worse than any other – we set our youngsters a very poor example.

Road Safety is a subject often brought up in assemblies, some schools incorporate it into some of their topic work and a large number, often in co-operation with a small band of willing parents and/or the Road Safety Officer, run a Cycling Proficiency Course sometime during the year. As we started to set up our course this year, I decided to look around to see if there were any computer programs available which might help – after all aircraft/space pilots are not asked to risk life and limb or expensive craft until they've spent some time on a simulator. Indeed, I was pleasantly surprised, not only by the amount of software available to support road safety projects in general but also at the quality of it, and I don't suppose for a minute I've found it all.

CYCLING PROFICIENCY

Since my search started with programs for the Cycling Proficiency Course, let me begin by taking a look at two sets of programs specifically designed to help with that.

The *Road Safety Programs* are designed to illustrate graphically the tasks given by Road Safety Officers/teachers as part of the Cycling Proficiency Scheme (or by teachers doing a project on road safety), ie they are intended to be used as an electronic blackboard. The quality of the graphics is such that they serve their purpose extremely well, and will certainly brighten up any presentation.

The programs can be briefly described as follows: *The Bicycle* draws all the major components of a bicycle in a logical sequence to build a complete bicycle. Two options are available: a) a fully automatic drawing, and b) a step by step drawing, each step easily controlled by the user, with no time limit. A version of the BMX bicycle is also included. *Traffic Lights* depicts a road-user's view of a set of traffic lights. The sequence of lights, and their interpretation, is again controlled by pressing the Space Bar. Options include the facility to suppress text until required, addition of an independent filter arrow and addition of a fixed sign, ie turn left only.

Pelican Crossing: first option allows the user to select pedestrian's or road user's view of Pelican crossing lights, with a representation of the lights as seen by the other, and sound when appropriate. Further options include a fully automatic sequence and a manual sequence controlled by the user*Road Signs* includes two sets of main road sign configurations. The first set includes four examples of the warning, mandatory, prohibitive and information signs many of which have particular relevance to cyclists, while the second set gives 12 further examples from the first three groups.

The second set, entitled *Bike*, covers three turning manoeuvres the cyclist is expected to know: turning right from minor road to major road, turning left from minor road to major road, and turning left from major road to minor road. The programs may be used in three ways:

Demonstration is a graphic demonstration of the manoeuvre, requiring no further keyboard operation once the option has been chosen. Each action taken by the cyclist is described at the bottom of the screen.

Order of Events: the actions required to carry out a manoeuvre are displayed in random order on the screen. When all the actions have been placed in the correct order, the cyclist will carry out the manoeuvre. If an event is not in its correct position, the cyclist performs the manoeuvre until it reaches the incorrect event and the user then has to correct the error.

User Move: the cyclist can be guided through the manoeuvre on

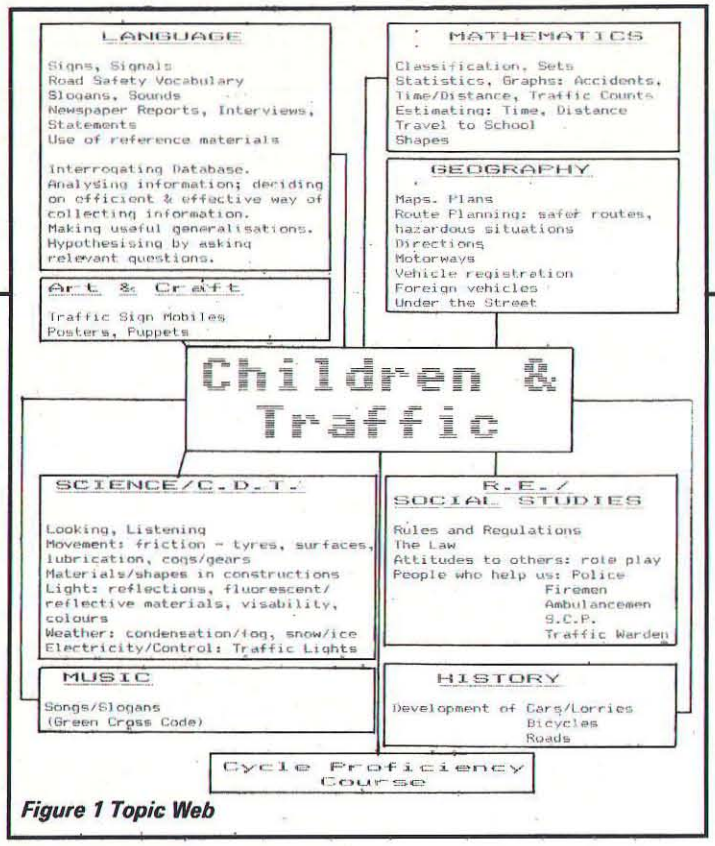
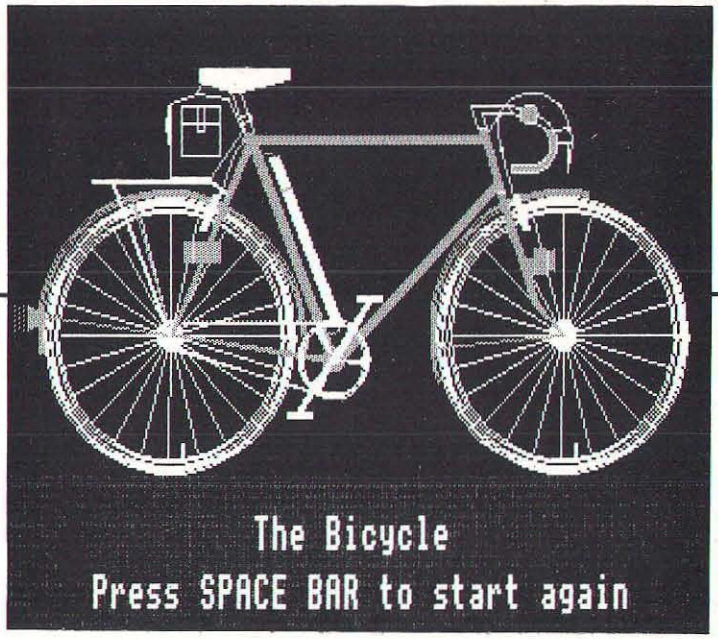


Figure 1 Topic Web



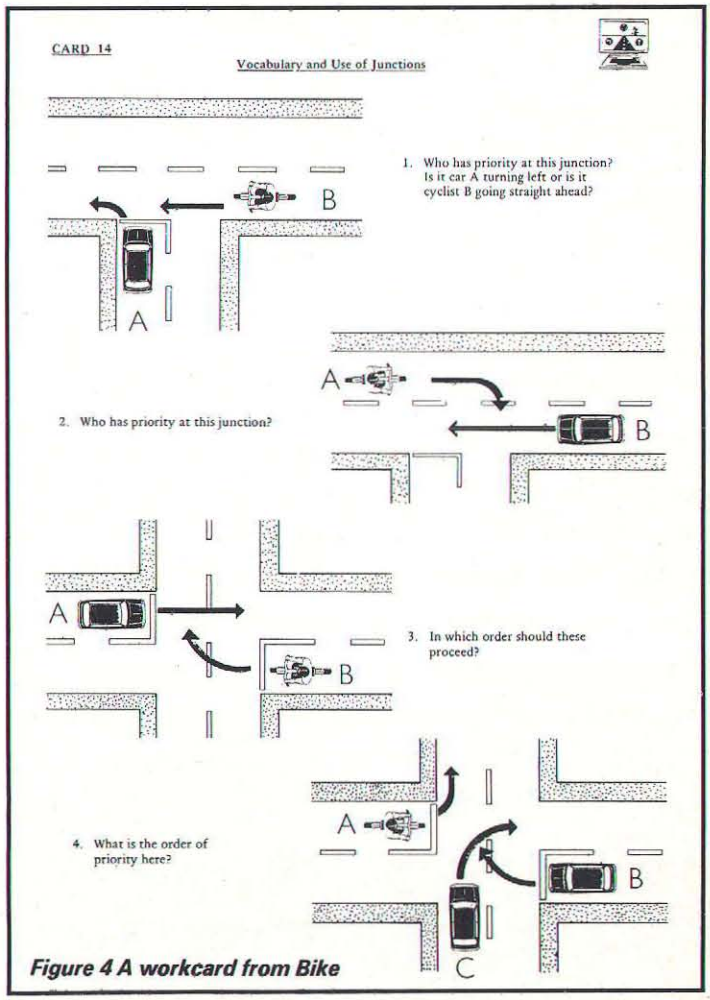


Figure 4 A workcard from Bike

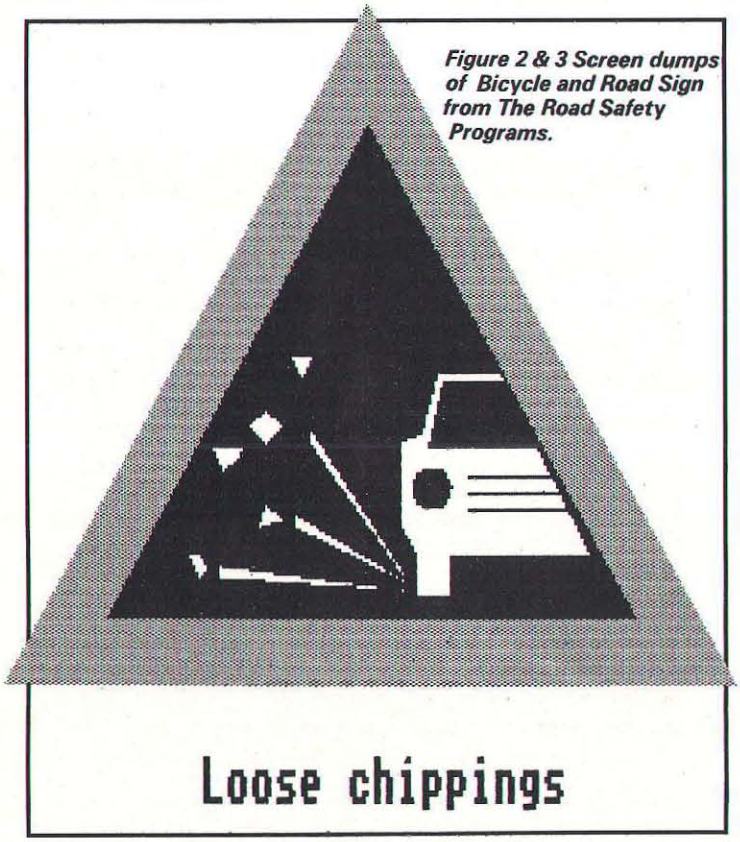


Figure 2 & 3 Screen dumps of Bicycle and Road Sign from The Road Safety Programs.

the screen using the function keys. Beware of traffic!

The programs are accompanied by a set of 14 workcards designed to give a structured development to the pupils knowledge of using the road, directions, signals, positioning, junctions and signs, and vocabulary. Having seen the first set of programs, most users will be disappointed in the quality of the graphics and lack of colour. They left me looking forward to the interactive video. Nevertheless, they serve their purpose, even if they do so with little panache.

ROAD SAFETY PROJECTS

The Humberside *Road Safety Project* contains two programs in which the emphasis is on problem solving and forming appropriate strategies in the context of road safety. In the first program, *To School Carefully*, which is intended for the 7+ age group, the object is to plan as carefully as pos-

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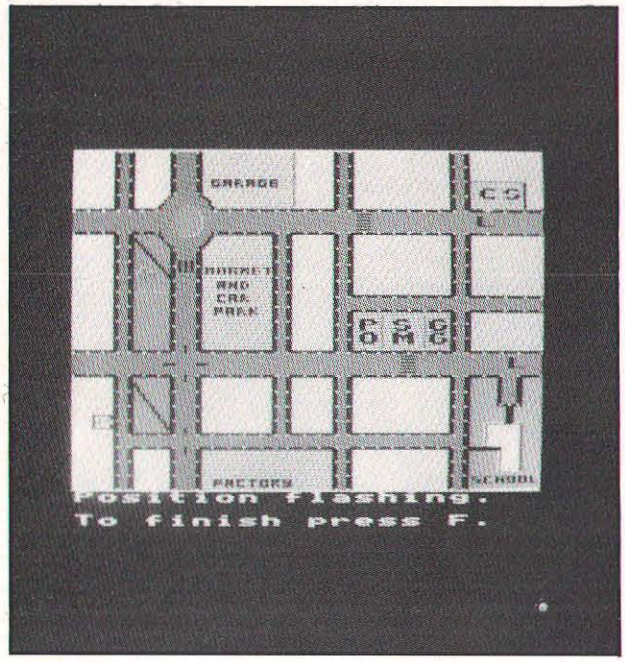


TO SCHOOL CAREFULLY — PUPILS' WORKSHEET

Name of group ..... Level .....

	What you need to know	√ your 'run'
LEVELS 1, 2 and 3		**DAY:**
	On Monday it is delivery day at the factory. There are lots of heavy lorries around. Try not to walk near the factory.	MONDAY
	On Tuesday, it is market day. There are lots of cars using the car park. Try not to walk near the market.	TUESDAY
		WEDNESDAY
	On Thursday it is factory delivery day.	THURSDAY
	On Friday it is market day.	FRIDAY
		WEATHER:
	On wet days, the footpaths across the churchyard and the park are very muddy.	WET
	You should not use them.	DRY

		CALL AT:
LEVELS 2 and 3	Your friend's house is F on the computer map.	Friend's house
	Your auntie's house is A on the computer map.	Auntie's house
	You post letters inside the post office.	Post Office
	The supermarket sells fruit and drinks.	Supermarket
	The greengrocer sells only fruit and vegetables.	Greengrocer
	The corner shops sells drinks but not fruit.	Corner shop

LEVEL 1
Mark your home on your map sheet. Mark your route.

LEVELS 2 and 3
Mark any places where you need to call on your map sheet. Mark your route.

LEVEL 3
Did anything happen on your way to school to make you change your plans? If so, mark it on your map.

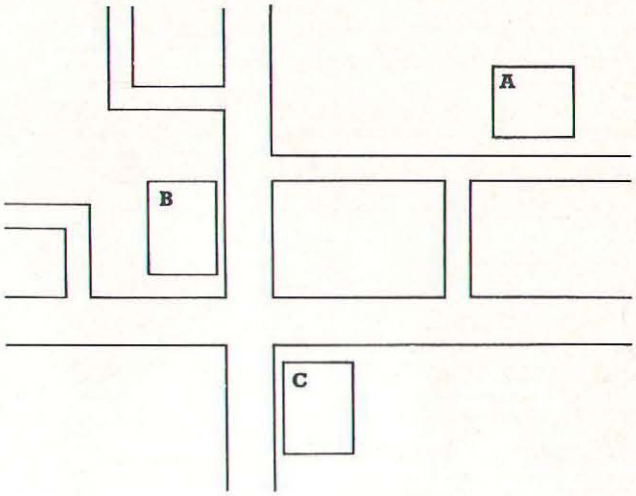
REMEMBER
If you cross the road outside your home, your mum or dad will see you safely across.
Look for safe places to cross, and ALWAYS use the GREEN CROSS CODE.

Figure 5 Screen Map and worksheet from To School Carefully

PUPILS WORKSHEET — MAKE IT SAFE

On this map you should mark

1. Primary school, Old Peoples Home, Secondary school
2. Main Road
3. Regions 1 to 6
4. Existing signs and signals
5. Items you have added or removed



Your budget is 20 points only

Traffic Lights	cost	4 points
Pelican Crossings	cost	3 points
Zebra Crossings	cost	2 points
Stop Sign	costs	1 point
Give Way Sign	costs	1 point
Removing an item	costs	1 point

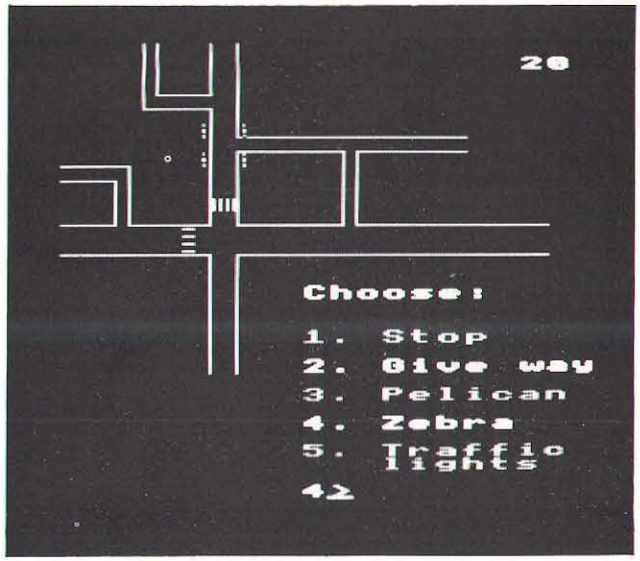


Figure 6 Map and Worksheet from Make It Safe

sible a route from home to school. A map of an urban setting, comprising a typical grid system of roads with main and side roads, is presented. On certain days parts of the town are particulary busy and care must be taken to avoid the areas.

The program has three levels of difficulty, which determine the number of variables the children have to manage. For the first two levels, all the relevant information is provided before the journey is undertaken, but at level three, unplanned for contingencies may occur which involve 'on the spot' decisions concerning a revision of the chosen route. If the user group (it's considered best to use the programs in a group as the discussion generated is valuable in the decision making process and the development of communication skills) tries to cross a road without remembering the Green Cross Code or at a dangerous place then a message appears on the screen. When the group has arrived safely at school, a screen-presented evaluation of the performance is available.

Make It Safe — intended for the 9+ age group — requires the group to consider the placement of road furniture to improve the accident statistics within a series of regions on an estate, thus making

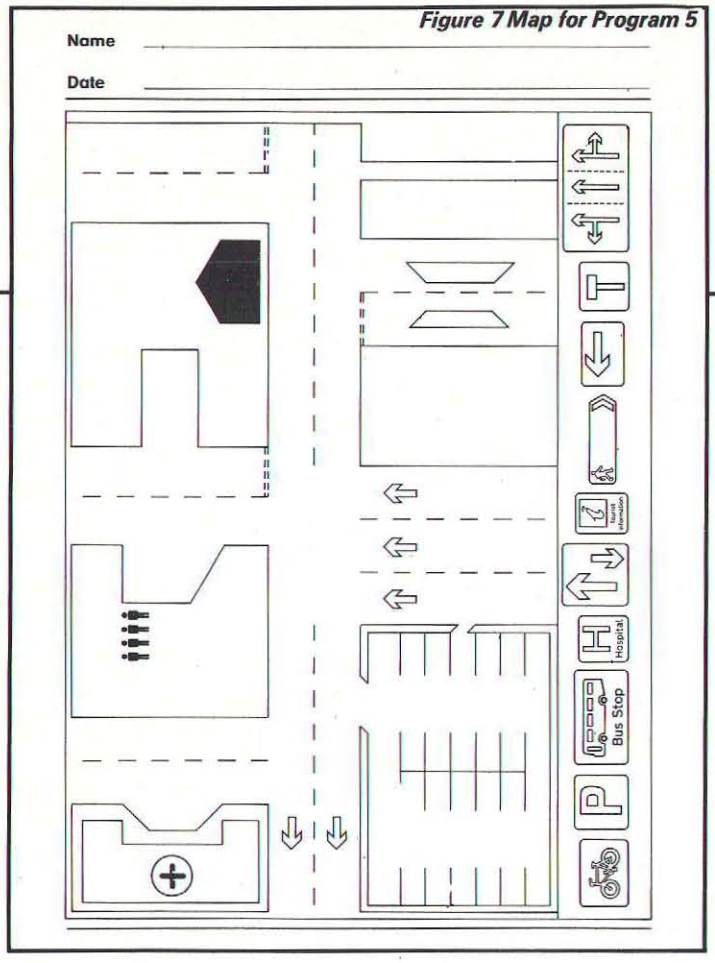


Figure 7 Map for Program 5

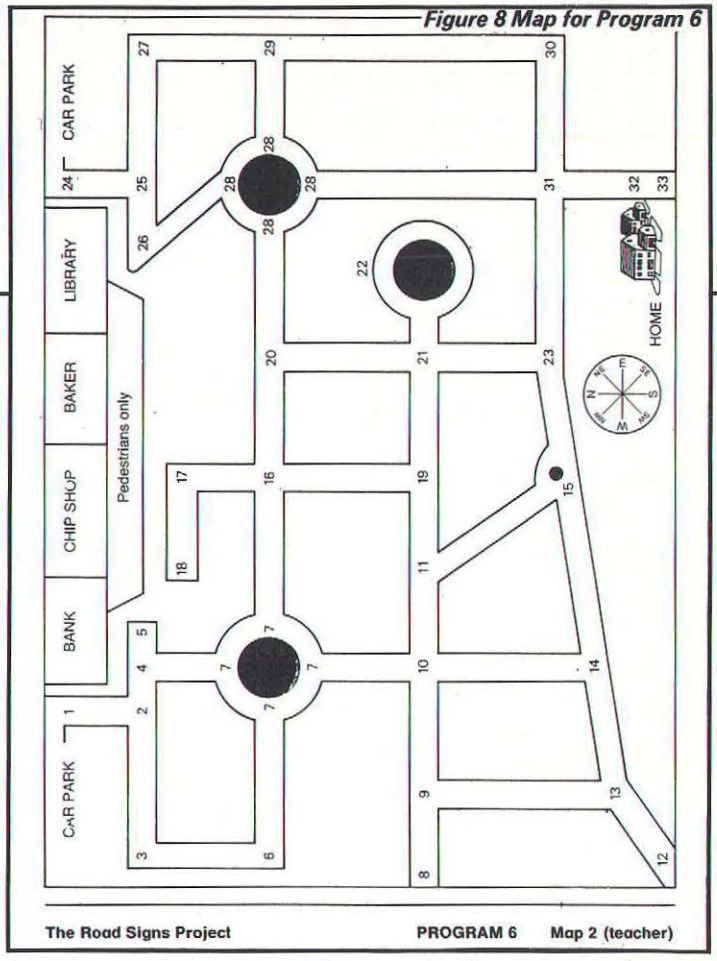


Figure 8 Map for Program 6

a housing estate a safer place to live. A map of an imagined housing estate is provided, complete with some road furniture. The accident statistics for six pre-chosen regions are shown on the screen. These depend on the placing of two schools and an old peoples' home.

The group discuss what improvements are to be made within the budget allowed (shown by the number of points rather than money) and they have the opportunity to alter the situation, taking into account the nature of the road concerned. Graphic representations of the furniture can be moved to any position on the map and, if inappropriately placed, a message will be displayed giving a chance to reconsider the position chosen. Will the accident statistics be improved by the alterations made? The Road Safety Computer predicts changes in the number of accidents based on the decisions made.

Decision making and problem solving are key words associated with software distributed by Fernleaf and, I must admit, I like their general approach to the use of computers with children. These programs are no exception to this, and I'm sure will be a very welcome addition to any project involving road safety. I particularly liked the latter program — I'm sure many children could teach the so-called experts a thing or two! I'd like to see a utility program which would enable the users to develop their own screen map — maybe of their own locality — within this program. Teachers wishing to follow up the idea of route planning/giving directions should consider *Town* (reviewed in A&B April 85), which will allow them to plan their own road network, eg the area around the school.

The Road Signs Project is a suite of eight programs based on a familiar feature of everyday life — road signs (what else!). The primary aim of the project is not for children simply to learn the meanings of the signs, but for the road signs to be used as a basis for other learning experiences. The programs are accompanied by a comprehensive Teacher's Guide and a very useful set of 48 black line masters provides various exercises, route maps and graded activities, which are closely linked with the programs.

Program 1 deals with the recognition of a small number of road signs and helps to develop an understanding of the connection between signs and meanings. In part one, the "easy" ones, the user has to type in the meaning of the signs, while in part two, there are some answers to choose from. Program 4 deals with Order and Warning signs and asks questions about each of them, while Program 5 introduces information signs and stresses the positive side of the system which controls traffic movement. The user is shown a town map in full — a printed copy of this is available in the pack — then only a small piece. One of the ten information signs available at the bottom of the screen has to be placed in position. At the end, a circle is drawn around the ones that are wrong. Unfortunately, there's no opportunity for a change of mind!

Programs 2 and 3 deal with traffic lights. The first section of program 2 asks the child to identify the traffic lights as displayed on the screen — colour recognition, associating colour with meaning and identifying correct sequence, while the second part involves prediction — which pattern will the lights show next? Program 3 puts the information practised in the previous program into context, the user having to drive a car around a road circuit involving traffic lights for three minutes. There is a speed option, which is useful for the younger children or those whose co-ordination and reaction is slow — ask a few adults to try!

Program 6 co-ordinates the previous programs by presenting a screen map incorporating several of the signs already encountered, introduces directional signs and uses road signs in conjunction with travel. Users have to plan routes from home to the shops. The emphasis changes in program 7 from interpreting road signs to using the road network and concentrates on direction finding. Two activities are suggested: find the route (quickest?) from Startown to Whitbeach or explore the blank parts of the map (again provided in the pack) and fill them in. The graphics, which depict the scene with the directional signs that the driver would see when approaching a junction or bend are very effective, as in the other programs.

The last program is a demonstration of all the major road signs used in the other programs. The Teacher's Guide gives information on ways in which these can be incorporated into other programs — a very thoughtful touch for those wanting to try their hand at writing programs.

This is a very comprehensive package. It has been well structured and so provides activities to support a project with children of a

CONTINUED OVER

Name _____

Date _____

Level 2/3

1 Find 4 different ways to travel to Whitbeach.
2 When is the best time to visit the seaside? Give the reasons for your choice.
3 Describe 4 different ways to get to Drypool and back to Startown.
4 What kind of outings do you like best?
5 Write about or draw a picture of an outing you enjoyed.
6 Write about or draw a picture of an outing you disliked.
7 Make up a treasure trail. Write about the things you have hidden in different places.
8 Plan an imaginary outing to one of the places marked on your map.
9 Take a chance and visit Warrenend. List all the roads and avenues and find the quickest way out.

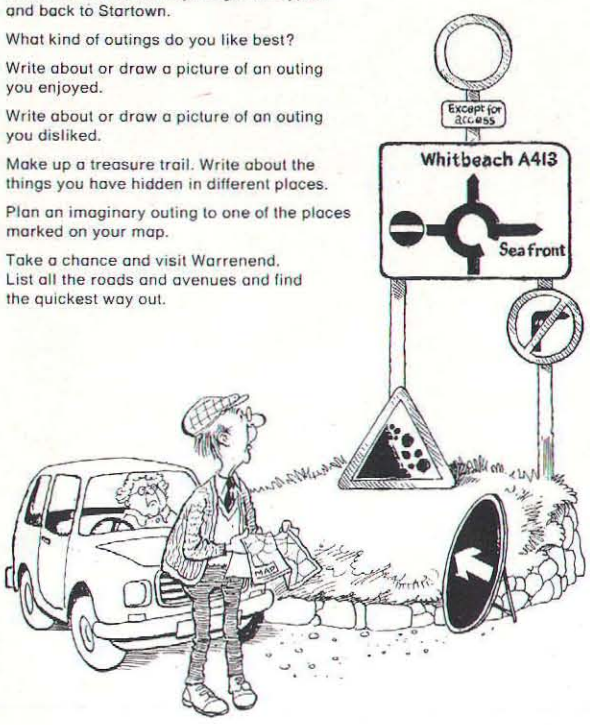


Figure 9 A Worksheet for Program 7

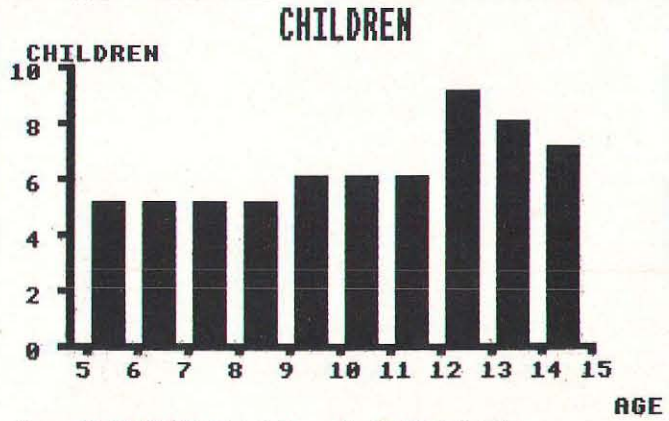


Figure 10 A PICFILE Graph from the ROSPA datafile

wide age/ability range. There were one or two niggles, where I thought the programmers could have been more friendly – the BREAK key taking the user right out of the program, not back to the MENU as one might hope in a suite of programs, and in Program 6, where "Route ends – Goodbye" leaves one up a cul-de-sac and the program has to be reloaded – but they were only niggles in an otherwise first class production.

STATISTICS AND MORE...

What about all those statistics that are collected about accidents? These can provide classes with a vast amount of information to create datafiles. I'm sure your Road Safety Officer will be able to let you have a printout of the latest accident figures for your area so that the children can make their own files, using a database suitable for their age, ability and experience.

If in doubt about how to go about it, it'll be worth having a look at *ROSPA's Accident Datafile*, which contains records of 66 actual accidents to children in the 5 – 14 age group, and is designed to be used in conjunction with *Factfile* (every school has a copy of this!).

Those who wish to be more adventurous may like to explore *Investigator*, which is a dedicated database developed by ITMA and the Devon Traffic Unit. This allows more complex enquiries to be made on Devon road accident records for 1983. Teachers with a small amount of programming knowledge should be able to adapt this program to work with their own data if they want to use more Fieldnames (Headings) than available in Factfile, but feel they, or their youngsters, are not ready to move on to one of the more sophisticated database systems.

HAVE SOME FUN!

Children will find it enjoyable working with most of the programs mentioned above, and although this is a very serious subject, a "fun approach" can often be very effective. For young children, many of whom will be taken to school by mum, dad or older brother/sister, there's that delightful little program, *Roadcraft 1*, which was reviewed in the Edsoft pages of A&B in November 84. Roger Roadcraft has to be taken across three roads. The program offers five skill levels – the higher the skill level the slower Roger crosses the road and the greater the volume of traffic. Zebra and Pelican crossings, policemen and crossing patrols offer a variety of methods of crossing the roads safely. The graphics are pleasing and it is "fun" – and what if you kill off Roger a couple of times; at least he'll come back to life for a rerun!

If you really feel like allowing the children to let their hair down, try to get hold of a copy of *Midtown*, which was produced by the Telesoft Project at Brighton Polytechnic for CEEFAX. In this program the operators have to find the fastest and cheapest route in a town to direct a car from A to B. There are one way streets, other traffic and a ring road, where the traffic moves a lot faster. The program checks the time, the amount of petrol used and the cost of repairs! Who's the best driver in your establishment?

I began with a quotation from "Children and Traffic". Let me end with another from the same series of books: *"Accident prevention is a method of equipping children for independence by creating within them a "safety consciousness" which will guide their behaviour in all circumstances, enabling them to identify and assess hazardous situations properly, to calculate risk responsibly and to widen the scope of their activities accordingly".*

Using the micro can pay an important part in this training – but only a part. Most of the programs mentioned in this article make excellent use of the micro. I've deliberately not set out to provide a "best buy". While some of the programs have "overlap", they mostly fulfill different purposes. Hopefully, I've provided sufficient information for you to decide which is/are most suitable for your project. At least none of them set a bad example, so they might prove useful with those thoughtless adults!

PROGRAM INFORMATION

The Road Safety Programs, David Seume, c/o Surrey CC, Road Safety Section, Highway House, 21 Chessington Road, West Ewell, Epsom, Surrey KT17 1TT, £14.50 (disc).

Bike, Clwyd Technics, Antelope Industrial Estate, Rhydymwyn, Mold, Clwyd £17.50 + £1.50 (p&p).

Road Safety Project, Fernleaf Educational Software, Fernleaf House, 31, Old Road West, Gravesend, Kent DA11 0LH, £18.95 (disc or cassette), £10.95 (individual programs).

Town, Cambridgeshire Software House, The Town Hall, St Ives, Huntingdon, Cambs PE17 4AL, £13.00 +£1.00 (p&p).

The Road Signs Project, Ward Lock Educational, 47, Marylebone Lane, London W1M 6AX, £29.95 (disc or cassette).

Investigator, Longmans Micro Software, 33-35, Tanner Row, York £10.95 (disc).
Accident Datafile, ROSPA, Cannon House, The Priory, Queensway, Birmingham B4 6B3, £5.00.

Picfile (includes enhanced version of Factfile) Cambridge Micro Software, Cambridge University Press, The Edinburgh Building, Shaftesbury Avenue, Cambridge.

Touch of Class

J.G. van Dijk

Make an impression with some stylish printer graphics.

Those of you who are the owners of dot matrix printers may envy those in possession of a daisy wheel printer, for the clear and even quality of its output. But dot matrix printers have advantages too; they are cheaper,for one, and most of them have a bit image capability, which means that they can produce graphic output, which no daisy wheel printer can.

Most of you will probably use the graphic potential of your dot matrix printers only to produce screen dumps, copied from a magazine, without using the ability to mix graphic and text data on one and the same sheet of paper.

These programs will do just this: you can design a letterhead, consisting of both graphic and text data, and use it to produce professionally looking letters. The letter itself will have to be written on a separate wordprocessor. Personalized letterheads are used by most companies and institutions to provide both an instant visual means of recognition and an effective way to impress the adressee. With a bit of inspiration and some careful design, you can produce an equally impressive personal letterhead with this program, which greatly improves the look of your letters, and gives them that touch of class.

But first we'll have to take a look at the way the printer manages graphic output, so you will be able to adapt the program to your own type of printer and wishes.

ESCAPE CODES

If you read your printer manual, you will find that it is full of incomprehensible ESCAPE, or ESC, codes; these have nothing to do with the escape key, but are control codes, and will have to be translated to BBC BASIC. Your printer manual will have a section on the meaning of its control codes, and there you will also find a number for each code, and these numbers are what the BBC can understand.

Using Epson code, used in most other makes as well, ESC will have a value of 27. This ESC code can be understood by the BBC if it is phrased as 'VDU 1,27'. The 1 means the following code is meant for the printer, and has to be inserted before each printer code. Now look under 'ESC L': the dual density bit image code; this will become VDU 1,27,1,76. The numbers are simply strung together.

The printer has to be told beforehand how many bit image data are to follow, in a somewhat user-unfriendly manner. Suppose you wish to send 120 data; you will have to send two numbers to the printer, following the ESC L code. Your manual and program 1 will show how to calculate these numbers, n1% and n2%. For 120 data, the manual will advise something like 'LPRINT CHR$(27); "L"; CHR$(120); CHR$(0)'. In BBC BASIC, this becomes: 'VDU 1,27, 1,76, 1,120,1,0. Now type in program 1, and run it. Line 120 sends one 'datum' to the printer. If the program prints a black rectangle, it works. To print graphics on more than one line, additions will have to be made. Add lines 30, 140 and 150 from program 2, and RUN. This should print 6 black rectangles, with spaces between them (line 140 performs a carriage return). The spaces are caused by the line feeds: a line feed will transport the paper over a distance of (usually) 12 dots, and the rectangles are only 8 dots high. To get rid of these spaces, add lines 20 and 160 (from program 2). Line 20 resets the line spacing to 8 dots, instead of the usual 12, and line 160 sets it back again. This is, in fact, ESC A. RUN, and all the rectangles should neatly touch one another, forming one large one. Now add the remaining lines of program 2, (change line 80) and run it; this should produce only the outlines of the former rectangle.

As they are, the programs assume that your printer does automatic line feeds; some, however, do not; this means that it will try to print everything on one line. The easiest way around this is to change one of the so-called DIP switches inside your printer. If this is for some reason not feasible, you can do the trick with software com-

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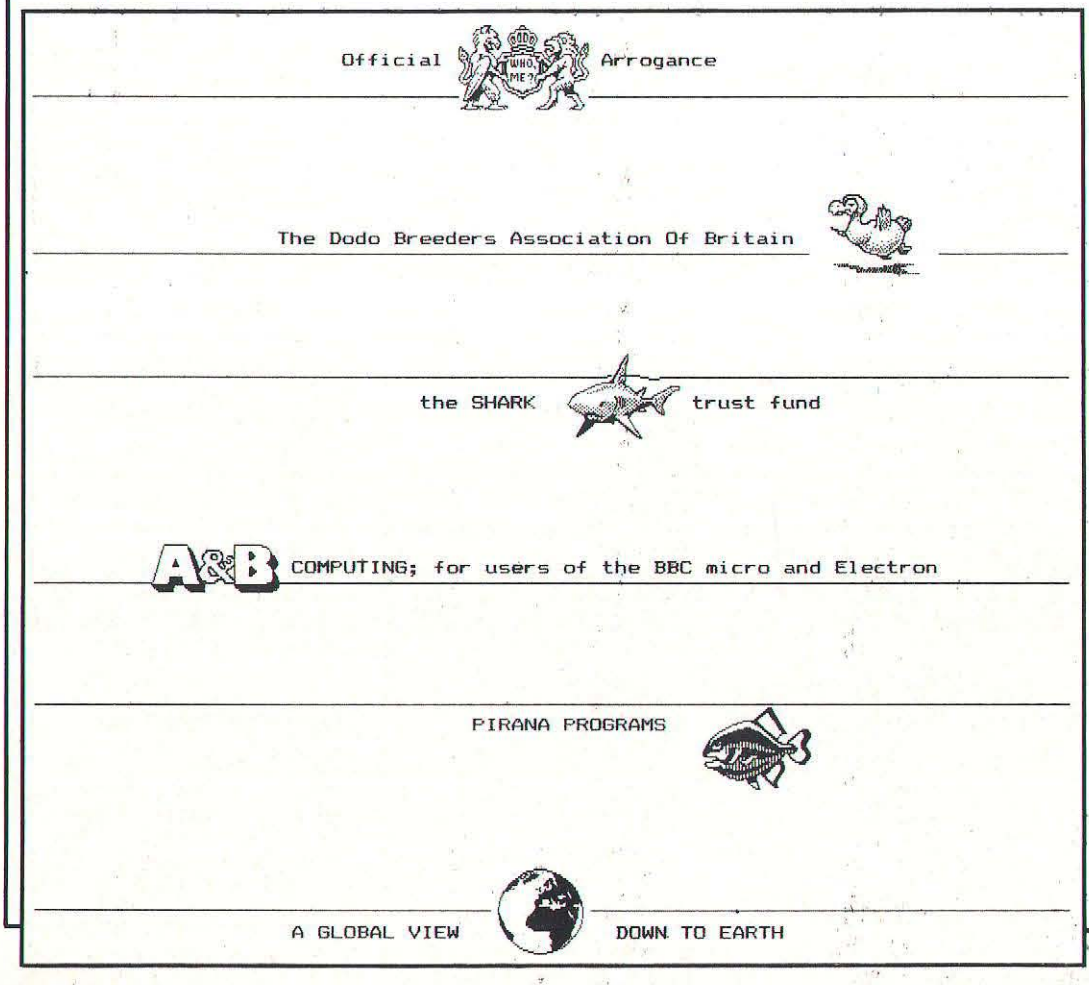
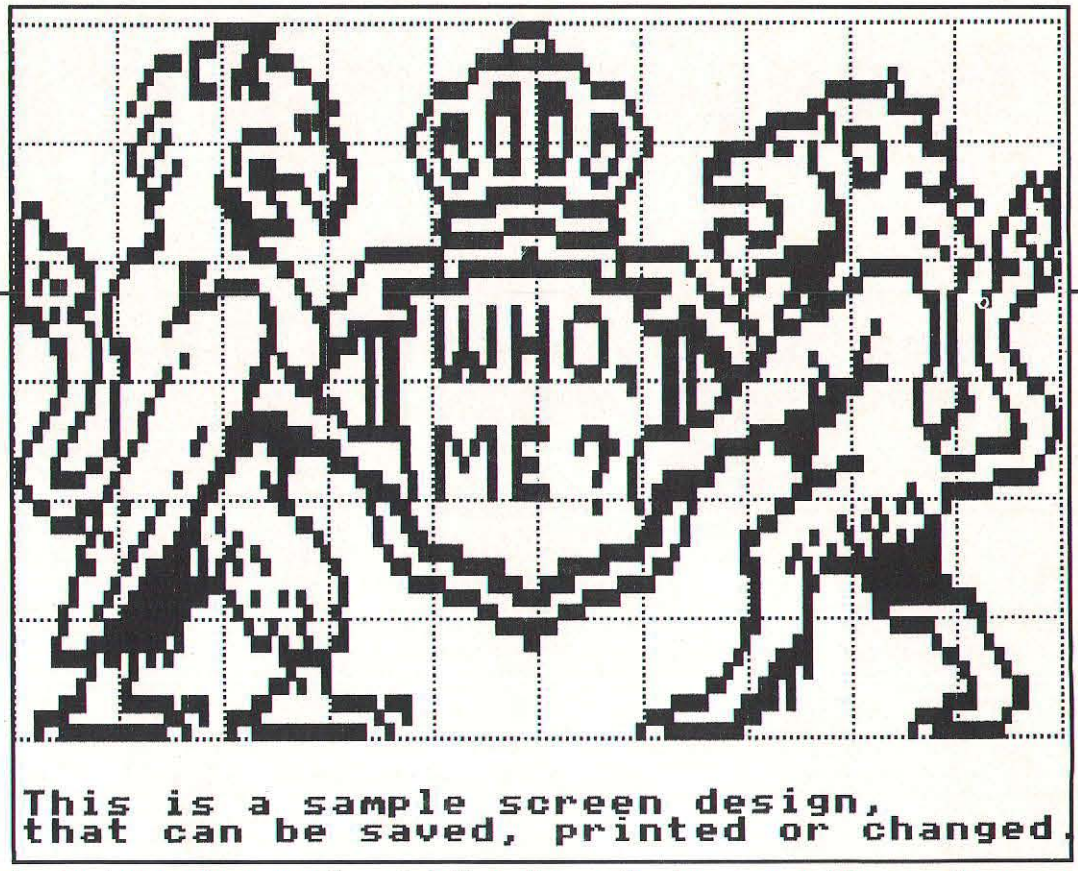




This is a sample screen design, that can be saved, printed or changed.

mands: put '*FX6,0' in the beginning of the program, and add the command VDU1,10 to lines saying 'VDU1,13'. In the long run it is a lot easier to change the DIP switch.

If program 2 works correctly, the graphics part of the main program will work as well.

THE PROGRAM

The program enables the user to design a drawing on a grid, in which individual squares can be filled in or whitened out again. In terms of printing dots, the grid has a size of 120 by 48 dots. The design can be saved on disc or on tape, and earlier designs may be loaded, printed or changed.

Apart from making a design, the program has two other options: you can instruct the computer to print text both in front of and behind the design, and it can print a simple horizontal line across the page, which gives a classy look, especially if you incorporate the line in the design. Some of the different possibilities are shown in the illustrations.

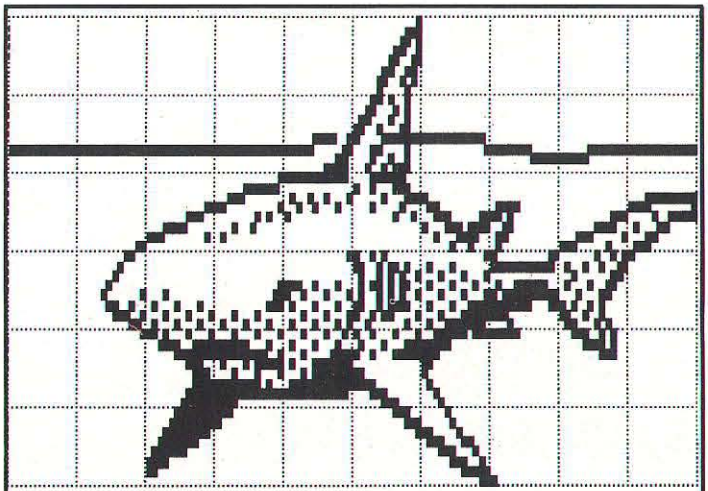
The size of the grid was chosen for several reasons: I wanted as large an area for the design as possible, and found that a larger size than the present one makes the individual squares of the grid too small to be handled easily on the screen. The design is divided into 6 horizontal rows of 120 vertical columns of 8 dots each, and this has to do with the way in which dot matrix printers operate: the printhead consists of a number of small pins, aligned vertically. Any combination of individual pins can be 'fired' at a time. The printhead then moves slightly in a horizontal direction, and by firing a different combination of pins a character is formed on the paper. The program is meant for printers using 8 pins in bit image mode (the printhead actually has 9 pins, but doesn't use the last one in graphics applications.) The combination of dots to be fired simultaneously is stored as a number, in a similar manner as a user defined character is formed using a VDU 23 command (details of this process will be given in your printer manual). Each of the pixels in a column can be filled in, and each has a value allotted to it, according to its position. These values range from 128 to 1. The sum of the values for all filled pixels gives a number, unique to that combination. If all pixels are filled in, that sum is 255.

The program will divide the design into 6 lines of 120 of these numbers each, and store them in a byte block. These numbers are sequentially offered to the printer, which then fires the right combination of pins.

A byte block is something like an array, but contains only single bytes, and can, for that reason, only hold numbers smaller than 256. It has to be dimensioned like an array (here: DIM block 720), and individual bytes can be read or written by accessing the block with a question mark. The advantage lies in memory requirements: in this program, 720 bytes are reserved for the block; an array of integer variables would need 2880 bytes, and a real variable array 3600 bytes, or about 3.5 K.

HOW TO MAKE A DESIGN

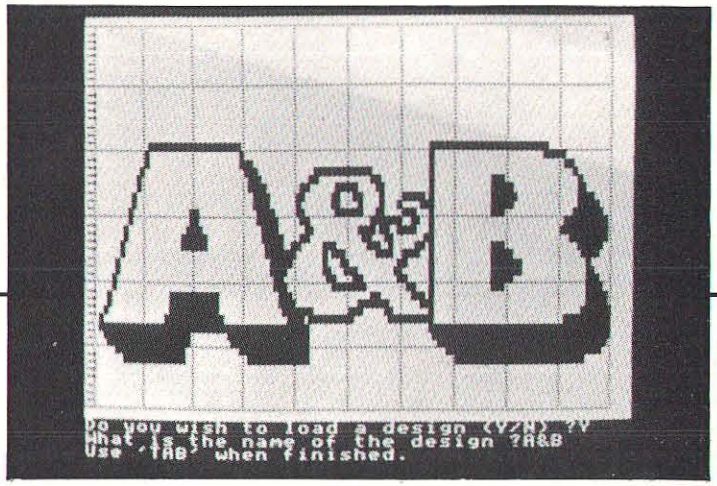
You can save a lot of time by making a sketch of the design on paper first, using a larger grid of 10 by 6 squares. When run, the program will draw this grid, and produce a small flashing cursor in the top right of the screen. The cursor keys will move it across the grid, and pressing the space bar at the same time speeds it up. Press 'B' to fill in a square. Pressing 'W' will blank out any incorrectly filled squares. Use your sketch to indicate the outlines of the design and fill the details in only after these look right. When the design is completed, press 'TAB'. Then you are offered the choices of saving the design, printing it, or of resuming work on it. The design is saved as screen memory: the upper part of the screen, showing the grid, is saved on disc or tape. This takes some time on tape based machines, but the alternative of storing the design inthe form of the array, and saving that as a file, requires a number of extra procedures for saving, loading and translating the array back into screen information again, and in the end takes about the same amount of time. For disc users, the method used here is the fastest one.



Lines in the letterhead can be incorporated in the design.

PRINTING THE DESIGN

If you choose the print option, the computer will fill the byte block with the values as explained above. You will then be asked to indicate



the position you want your design to be printed on. If you want any text, you may print it on the left of the design as well as on its right. Remember to add one (or more) space(s) to the leading text to create some space between the text and the design, if necessary. One space is added to the trailing text by the program. You should indicate on which of the 6 lines (rows) you wish the text to be printed. The letterhead is enhanced by printing a line across the paper; it can be printed on most of the 48 vertical positions, by choosing the character row first, and the dot row in that character row next (dot rows 1 and 2 are not acceptable, as they seem to insist on sending text data to the printer and messing up the design).

You can write and print letters using a wordprocessor just as you are used to, but should keep in mind that it may be necessary to start your letter with a few blank lines to provide room for the letterhead. The required number of lines may require a few tries, but the end result is well worth it. By alternately using 'form feed' and the print option you can easily produce a stock of your own paper, which is easier than running the program anew for each letter.

The procedure 'file' handles loading and saving of the appropriate screen memory, and is copied almost literally from the User Guide, page 463.

ADAPTING THE PROGRAM

The design is always printed as 120 by 48 dots, but may look somewhat different on different printers. Some printers can print 480 dots on a line, and others 1632. The design will look elongated in the first mode, and squeezed in the second. The screen design will be printed undistorted if the maximum number of dots on one line is 960. This is the case with the FX-80 and ITT 3351 in their dual density modes (the program was written using an ITT 3351). For other printers, the number closest to 960 will have to be chosen. The FX-100 can print 816 dots in its normal density mode, so this is better than the 1632 dots of its dual density mode. Choose the mode best suited to your printer, and change line 20 accordingly. 'Pix%' should hold the number of dots on one line, and 'bit%' the density mode, belonging to that number. For instance, use pix%=816 and bit%=75 for the FX-100, and 960 and 76 respectively for the FX-80 and ITT 3351. Remember that bit%=75 for ESC'K' and bit%=76 for ESC'L'. Finally, 'span%' holds the number of characters that can be printed on one line, which is very likely to be 80. Change it, if necessary. This variable is used to let lines and text line up with the design. Different printers have different peculiarities. Especially if you try to mix graphic and text data, your printer may surprise you with sudden spaces or line feeds. You will have to experiment to find the cause of this; it is wise to try the program with a simple design first, such as a rectangle, and print that without text or lines. Add these one at a time, to find the cause of any problems.

You can delete all options from the program, and give fixed values to the printing variables instead. By adding a procedure to print your name and address, in condensed print, for instance, the letterhead can be expanded, and becomes fully 'automated'. By changing PROCdraw you can produce mirror images of your designs: just change 'FOR R%=0 TO 119' to 'FOR R%=119 TO 0 STEP-1'.

It is possible to call PROCdraw more than once on one line, to produce, for instance, a normal as well as a mirrored print, but the text and line options will then have to be adapted.

Finally, if the number of dots your printer can produce on one line is very different from 960, you might want to adapt the design on screen to be able to remove all distortion.

EXPLANATION OF THE PROGRAM

Lines 30 to 170 are the program proper, and control the program's workings. Line 50 and 60 set variables, introduced in the main text. Line 70 reserves memory space for the design and the name of the program. Line 110 selects loading an old design or drawing a grid for a new one. Line 130 to 170 select options.

PROCgrid this draws a grid, over which the design may be drawn.

PROCdesign handles movement of the cursor over the grid, and calls PROCmark to fill or delete pixels in the design. Note how line 290 handles fast movement of the cursor, by setting a value for the displacement controlled by following lines.

PROCmark draws a black, white, or a deleting cursor, depending on the variables it is called with.

PROCfillblock uses 3 nested loop to examine each pixel of the grid in turn, and calculates the value for a vertical column of 8 pixels (N%), which is then entered in the byte block called "block", in line 520.

PROCoutput first sets the line distance to 8 dots, and then loops through the 6 lines of the design, and selects different procedures according to whether a drawn line, the text, or the drawing only are to be printed on that line. Line 630 resets the line distance, and 640 to 660 handle repeated drawing of the same design.

PROCline is used to draw the (character) line of the design on which a straight line across the paper is to be printed. "Data%" holds the number of dots to be printed first in front of the design, line 690, and later that after it, in line 710.

PROClinesegment draws a line, with a length determined by data%. The height of the drawn line on the charactre line is held in DT%.

PROCdrawonly moves the printhead to the beginning position of the design, and then transfers control to PROCdraw.**PROCdraw** draws one horizontal slice of the design, read in from the byte block. The height of the slice through the design is held in the variable "line%", which is controlled in PROCoutput.

PROCtext moves the printhead along the paper far enough to let the text line up with the design, and the prints the leading text, a slice of the design (by calling PROCdraw), and finally the trailing text.

PROCedit handles the composition of text, line and design on paper. It is fairly well protected against incorrect entries.

PROCfile handles loading and saving a portion of the screen memory under control of the program. The method followed is described in the User Guide; users of BASIC 2 might like to use OSCLI commands instead.

PROGRAM LISTING 1

```
10VDU2:REM turn the printer on
40data%=120
50n1%=data%MOD256:n2%=INT(data%/256)
60VDU1,27,1,76,1,n1%,1,n2%
70FOR R%= 1 TO data%
80dots%=255
120VDU1,dots%
130NEXT
170VDU3:REM turn printer off
```

CONTINUED OVER

PROGRAM LISTING 2

```
 10VDU2:REM turn the printer on
 20VDU1,27,1,65,1,8
 30FOR line%=0 TO 5
 40data%=120
 50n1%=data%MOD256:n2%=INT(data%/256)
 60VDU1,27,1,76,1,n1%,1,n2%
 70FOR R%= 1 TO data%
 80dots%=0
 90IF line%=0 THEN dots%=128
100IF line%=5 THEN dots%=1
110IF R%=1 OR R%=data% THEN dots%=255
120VDU1,dots%
130NEXT
140VDU1,13
150NEXT
160VDU1,27,1,65,1,12
170VDU3:REM turn printer off
```

PROGRAM LISTING 3

```
  10REM J.G.van Dijk / Aert van Neslaan 442
  20REM 2341 HR Oegstgeest / the Netherlands
  30MODE 4
  40REM the next line may have to be changed; see
 text!
  50span%=80:bit%=76:pix%=960
  60dotchr%=pix%/span%
  70DIM block 720,name 25
  80GCOL0,129:CLG:VDU28,0,31,39,27:CLS
  90VDU23,225,112,112,112,112,112,0,0,0
 100INPUT"Do you wish to load a design (Y/N) ",G$
 110IF G$="Y"THEN PROCfile("L") ELSE IF G$="N"THE
N PROCgrid ELSE100
 120************
 130REPEAT:PROCdesign
 140INPUT"Print, save, continue or quit (P/S/C/Q)
",menu$
 150IF menu$="P"THEN PROCfillblock:PROCedit:PROCo
utput
 160IF menu$="S" THEN PROCfile("S")
 170UNTIL menu$="Q" OR menu$="q":END
 180**************
 190DEFPROCgrid:GCOL0,0
 200FOR C%=0TO120STEP12:MOVE C%*10+25,184:PLOT21,
C%*10+25,1000:NEXT
 210FOR D%=0TO48STEP8:MOVE0,D%*17+184:PLOT21,1225
,D%*17+184:NEXT
 220FOR D%=0TO48:MOVE15,D%*17+184:DRAW25,D%*17+18
4:NEXT
 230ENDPROC
 240**********
 250DEFPROCdesign
 260PRINT"Use 'TAB' when finished.":VDU5
 270E%=1205:F%=983
 280FLAG%=0:REPEAT
 290IF INKEY(-99)=-1THEN fast%=4ELSE fast%=1
 300IF INKEY(-58)=-1 THEN F%=F%+fast%*17
 310IF INKEY(-42)=-1 THEN F%=F%-fast%*17
 320IF F%>1000THEN F%=1000
 330IF F%<201THEN F%=201
 340IF INKEY(-26)=-1 THEN E%=E%-fast%*10
 350IF INKEY(-122)=-1 THEN E%=E%+fast%*10
 360IF E%>1215THEN E%=1215
 370IF E%<25THEN E%=25
 380PROCmark(4,0):FOR R%=1TO100:NEXT:PROCmark(4,0

 390IF INKEY(-101)=-1 THEN PROCmark(0,0)
 400IF INKEY(-34)=-1 THEN PROCmark(0,1)
 410IF INKEY(-97)=-1 THEN FLAG%=1:REM Use INKEY -
99 for Electron Space Bar or other alternative key
 420UNTIL FLAG%=1:VDU4:ENDPROC
 430**************
 440DEFPROCmark(COL1%,COL2%):GCOL COL1%,COL2%:MOV
E E%,F%:VDU225:ENDPROC
 450**********
 460DEFPROCfillblock
 470FOR line%=0TO5:line1%=1000-4-136*line%
 480PRINT" * busy with line ";line%
 490FOR W%=0TO119:W1%=31+W%*10
 500N%=0:FOR S%=0TO7
 510IF POINT(W1%,line1%-S%*17)=0 THEN N%=N%+2^(7-
S%)
 520NEXT:block?(line%*120+W%)=N%
 530NEXT:NEXT:ENDPROC
 540**************
 550DEFPROCoutput
 560VDU2,1,27,1,65,1,8
 570PRINT:FOR line%=0TO5
 580IF line%=TXT% THEN PROCtext:GOTO620
 590IF line%=RL% THEN PROCline:GOTO610
 600PROCdrawonly
 610VDU1,13
 620NEXT
 630VDU1,27,1,65,1,12,3
 640INPUT"AGAIN (Y/N)",G$:IF G$="Y"OR G$="y"THEN6
50ELSE ENDPROC
 650PRINT"Advance paper,and press any key to prin
t"
 660G=GET:GOTO560
 670**************
 680DEFPROCline
 690data%=dotchr%*char%:PROClinesegment
 700PROCdraw
 710data%=pix%-120-dotchr%*char%:PROClinesegment
 720ENDPROC
 730**************
 740DEFPROClinesegment
 750n1%=data%MOD256:n2%=INT(data%/256)
 760VDU1,27,1,bit%,1,n1%,1,n2%
 770FOR R%=0TO data%:VDU1,DT%:NEXT
 780ENDPROC
 790**************
 800DEFPROCdrawonly:FOR R%=1TO char%:PRINT" ";:NE
XT:PROCdraw:ENDPROC
 810**************
 820DEFPROCdraw:VDU1,27,1,bit%,1,120,1,0
 830FOR R%=0TO119:VDU1,block?(line%*120+R%):NEXT:
ENDPROC
 840**************
 850DEFPROCtext:VDU1,27,1,69
 860FOR R%=1TO char%-A%:PRINT" ";:NEXT
 870PRINTA$;:PROCdraw:PRINT" ";:PRINTB$
 880VDU1,27,1,70,1,27,1,65,1,8
 890ENDPROC
 900**************
 910DEFPROCedit
 920number%=INT(span%-1-120/dotchr%)
 930PRINT"Position of design (1-";number%;")":INP
UTchar%
 940IF char%>number%THEN920
 950INPUT"Do you want any text (Y/N) ",G$
 960IF G$="N"OR G$="n"THEN TXT%=10:GOTO1060
 970PRINT STR$(char%-1);" spaces available in fro
nt of design."
 980PRINT"Leading text ?":INPUT A$:A%=LEN A$:IF A
%>(char%-1)THEN 980
 990IF char%>=number%THEN B$="":GOTO1040
1000number2%=INT(span%-2-char%-120/dotchr%)
1010PRINT STR$(number2%);" spaces available after
 design."
1020PRINT"Trailing text ?":INPUT B$
1030B%=LEN B$:IF B%>number2%THEN1000
1040INPUT"On what row do you want the text (0-5)
",TXT%
1050IF TXT%<0 OR TXT%>5 THEN GOTO1040
1060INPUT"Do you want a line (Y/N) ",G$
1070IF G$="N"OR G$="n"THEN RL%=7:ENDPROC
1080INPUT"At which character row (0-5) ",RL%
1090IF RL%<0 OR RL%>5 THEN1080
1100INPUT"At which dot row (0,3-7) ",DT%
1110IF DT%=1OR DT%=2OR DT%>7THEN1100
1120DT%=2^(7-DT%):ENDPROC
1130**************
1140DEFPROCfile(Z$)
1150INPUT"What is the name of the design ",G$
1160IF G$=""THEN1150
1170IF Z$="L"THEN $name="LOAD "+G$
1180IF Z$="S"THEN $name="SAVE "+G$+" 5800 79C0"
1190X%=name MOD256:Y%=name DIV256:CALL &FFF7:ENDP
ROC
```

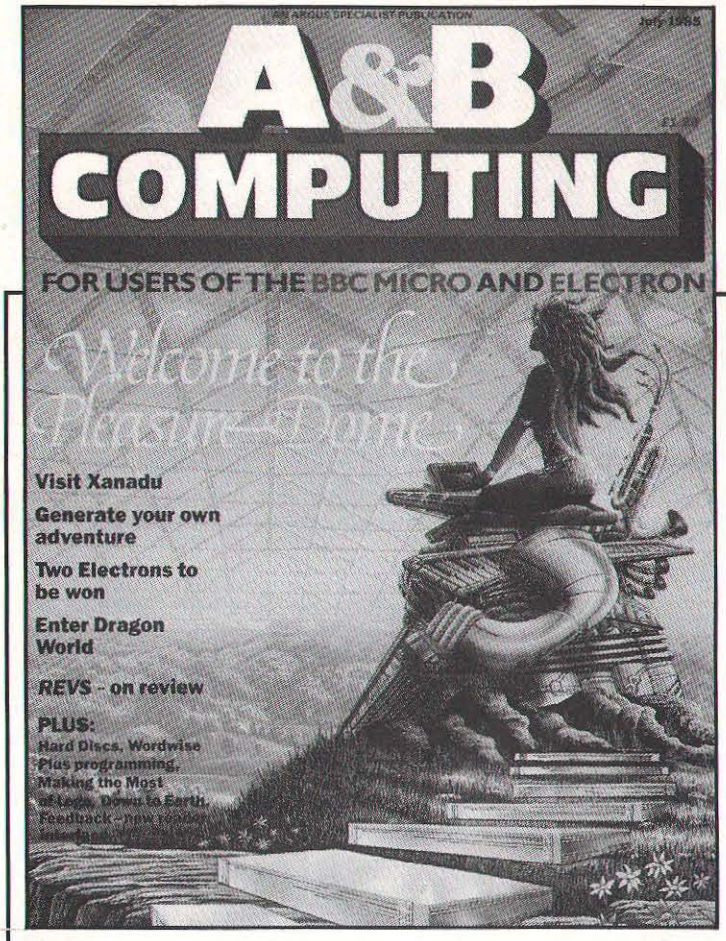
Making the most of Assembler

Games effects are best achieved in assembler. Try this simple example, well loved by games programmers.


```
   10REM Pulsate
   20REM By Kevin Mo
rtimer 20/2/85
   30MODE1
   40colour_used=1
   50speed=10
   60oswrch=&FFEE
   70?&70=0
   80?&71=speed
   90?&72=0
  100FOR address=&73
 TO &7F:READ colour:
?address=colour:NEXT
  110DATA 4,1,5,2,6,
3,7,3,6,2,5,1,4
  120PROCassemble
  130PROCinterrupt
  140COLOUR 1:PRINT'
'TAB(16);"Pulsate":C
OLOUR 3:PRINT'TAB(10
);"By Kevin Mortimer
"
  150END
  160DEFPROCassemble
  170FOR PASS=0 TO 2
 STEP 2
  180P%=&A00
  190[OPT PASS
  200PHP:PHA:TXA:PHA
:TYA:PHA
  210INC &70:LDA &70
:CMP &71:BNE end:LDA
 #0:STA &70
  220INC &72:LDA &72
:CMP #13:BNE cont:LD
A #0:STA &72
  230.cont
  240LDA #19:JSR osw
rch
  250LDA #colour_use
d:JSR oswrch
  260LDX &72:LDA &73
,X:JSR oswrch
  270LDA #0:JSR oswr
ch:JSR oswrch:JSR os
wrch
  280.end
  290PLA:TAY:PLA:TAX
:PLA:PLP
  300RTS
  310]NEXT
  320ENDPROC
  330DEFPROCinterrup
t
  340?&220=0
  350?&221=&A
  360*FX14,4
  370ENDPROC
```

The flash speed and colours are read from DATA and put in zero page locations, the code assembled at &A00.

Locations &220 and &221 are set up with this start address and the *FX14,4 enables the start of vertical sync event. Further information about "events" is to be found in this issue.



Win an Electron in our adventurous competition!

Adventurescape is an Adventure writing environment, opening up a hitherto closed world of arcane programming.

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And while you are not designing for others, you can enjoy playing an Adventurescape creation. Our first Adventure is Xanadu.

Adventurescape is a very useful software tool, for games playing and designing. It is also the *key* to a wealth of programs, exciting Adventures and educational applications which are already under development. Xanadu is but the first.

Get a head start in our competition, open to individuals and school classes, which runs through until the autumn. Acorn Electrons and Prentice Hall books await the winners.

Adventurescape is available on disc and tape for the BBC, on tape for the Electron. £6.00 disc (state format), £4.00 cassette (state computer). Cheques made payable to ASP. Xanadu comes free with all copies of Adventurescape and disc users get documentation files.

Have you played Xanadu, last months feature adventure game? Do you think you could write a better adventure? If you think you can, we'd like you to enter our competition.

Xanadu was written using Adventurescape, A&B's own adventure generator (which we think is better than the Quill!) and for this month's competition, we'd like you to send us your own adventure game written using Adventurescape. Now we accept that this is a rather more difficult task than the usual 'spot the difference' or 'wordsquare' competition, so for added inspiration, we're offering a bit more than the usual run-of-the-mill competition prizes.

You can enter either a BBC or Electron adventure and the authors of the adventure judged to be the most original/most amusing/most intriguing and most mind-boggling in each category will receive an Acorn Electron and have their games printed in A&B. What more could you want!

As we expect to be inundated with adventures (and there's not room for them all to be printed in A&B) we're offering the 10 runners-up copies of a new book, *Adventures with the BBC Micro* by Van Engelen donated by the publishers, Prentice Hall International. So get writing – you can't lose!

HOW TO ENTER

When you have written and debugged your masterpiece, The Habit, Delete, Snowfall or whatever, send it to us on cassette/disc, with suitable documentation at:

Adventurescape Competition
A&B Computing
1 Golden Square
London W1R 3AB

to arrive no later than last post on 2nd September, 1985. If you'd like us to return your adventure, please include a stamped, addressed envelope.

THE RULES

Entries will not be accepted from employees of Argus Specialist Publications Ltd, their printers and distributors, Acorn Computers or Prentice Hall International. This restriction also applies to employee's families and agents of the companies.

All the winners will be notified once the competition has closed, and the results and the two winning games will be published in a future issue of *A&B Computing*.

No correspondence will be entered into with regard to the competition and it is a condition of entry that the Editor's decision is final. The How to Enter section forms part of the rules.

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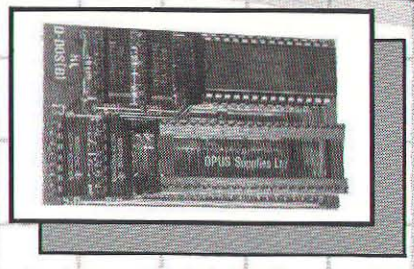

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The Mighty Mouse

Tony Self

Last November Applied Memory Systems Limited (AMS) launched their mouse as the alternative way of interfacing the user with a Beeb. Since then it has received rave reviews (A&B Feb 85), both for the mouse and the art software which was bundled with the package.

Now, before we have begun to tire of using AMXart, AMS have launched two new packages; AMX Utilities – a valuable extension to the original AMXart program and AMXdesk – an integrated package of desktop routines. Also we have seen the first commercial offering for the AMX mouse from an independent supplier in the form of Watford Electronics' Colour Art.

In this article I will be reviewing all three packages and also supplying a few hints and tips.

ART UTILITIES

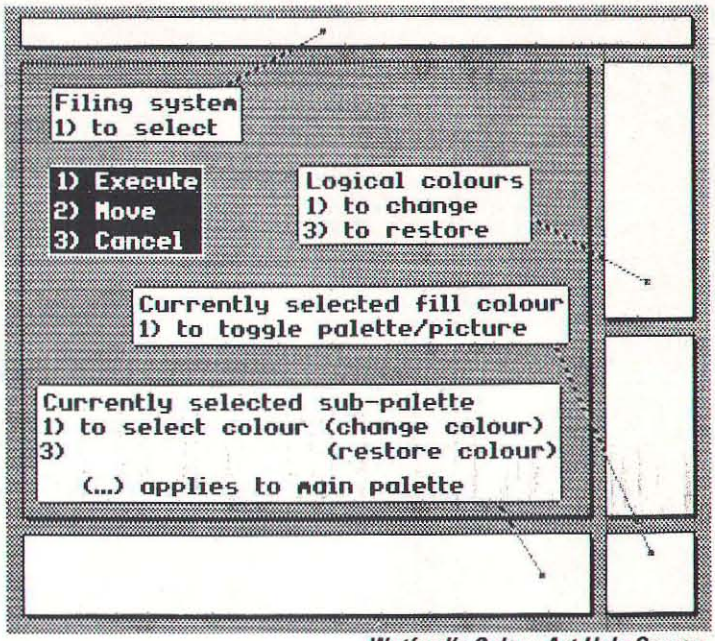
This is a disc based package, supplied on a 40 track disc with a 27 paged A5 user guide. The software comes in a glossy cardboard package, which gives it a professional look that will stand out on the dealers shelves, but does not serve as a useful permanent holder. I would have liked to have seen the more usual plastic library wallet.

The user guide is produced in the same style as the original Mouse and AMXart guides. It provides clear instructions on how to use the facilities and is full of screen dumps illustrating the points.

As I mentioned, you are supplied with a 40 track disc, but a program is supplied on the disc to convert it to 80 track format, by **CHAIN**ing "80". This is were I encountered my first problem. There is no write protect notch on the disc. Being fairly deft with with a pair of scissors, that problem was quickly solved. However, my troubles were not over as the "80" program refused to run with OPUS DDOS installed. I also tried with a Watford DDFS and had similar problems. Having found a friend with a standard Acorn DFS I was happy to see that the converted disc ran quite happily with the OPUS DDOS. I would therefore recommend that anybody with a DDFS and 80 track drives, asks their dealer to convert the disc for them when it is purchased. It would obviously have been a lot simpler if AMS had supplied the software on a dual format disc.

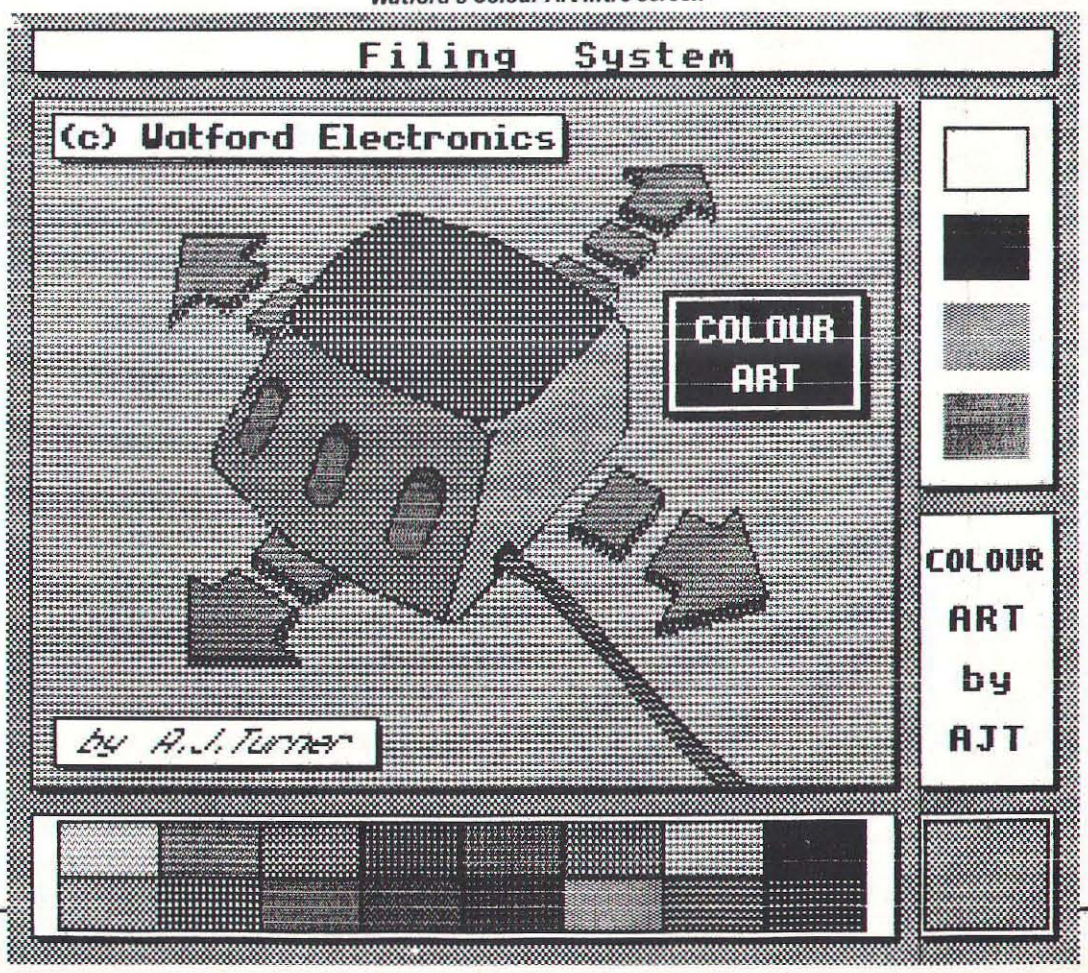
Having overcome these system problems I booted the disc to be presented with a menu display depicted by a series of icons. There are eight options which are selected, as you would expect, by moving the mouse and pressing the *execute* button. The options consist of AMXart2, Design, Pattern, Utils, Xdgen, Slide, Sketch & Strip.

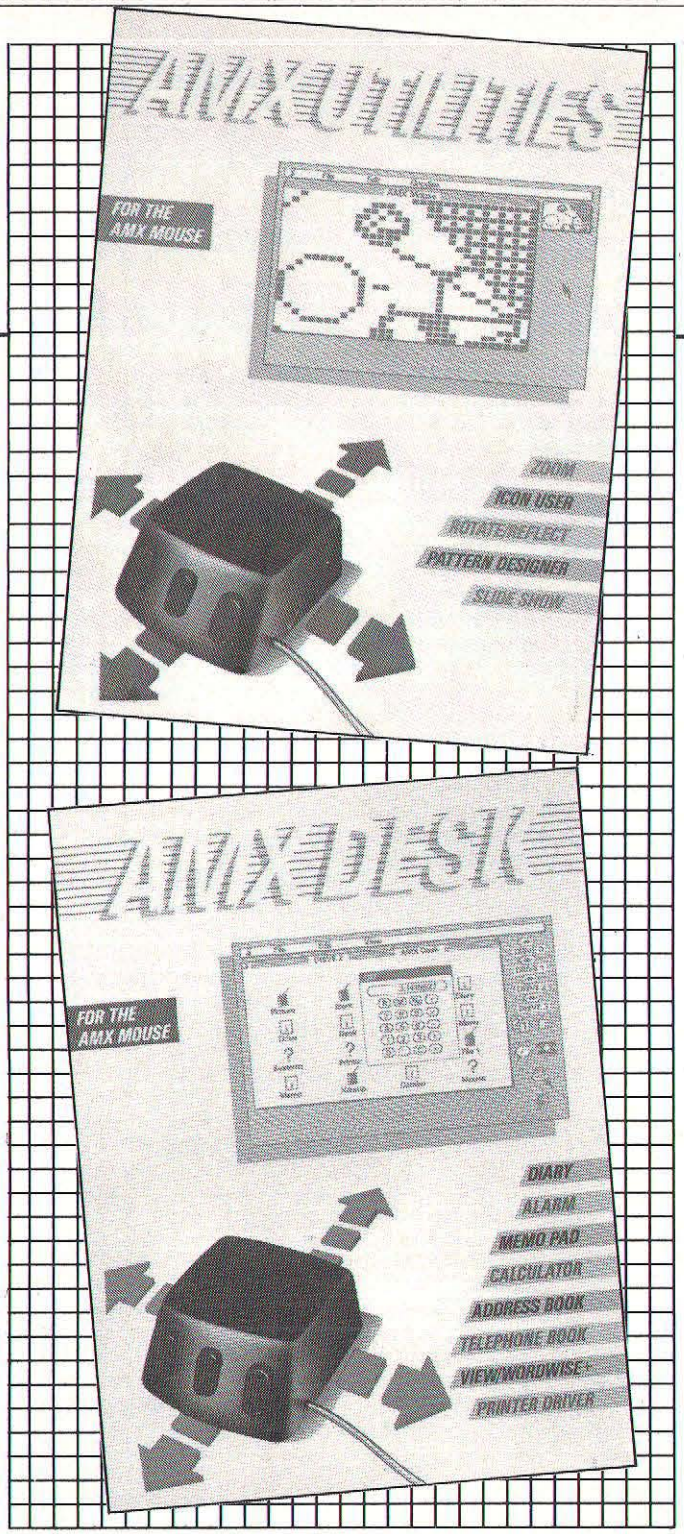
The AMXart2 is a slightly revamped version of the original which has the infamous bug cured (see hints and tips) and an additional option included on the files menu, which allows you to load in a different selection of fill patterns. Also included from the original AMXart disc is the Design program. This is purely for convenience, so you can relegate your old disc to your backup store.



Watford's Colour Art Help Screen

Watford's Colour Art intro screen





PATTERN

Now to look at the new programs. Pattern is a very similar to the icon Design program, but tailored specifically for designing new fill patterns to be used with the load fills option in AMXart2. The program automatically loads in the original pattern set in the lower window and then you have the opportunity to load in another set in the window above. In a similar way to the icon Design program, you can drag a pattern across to the defining window by using the *move* button.

The pattern is then displayed with one character block for each pixel. The basic pattern character is only made up from an 8 x 8 pixel grid, unlike the icons which are 16 x 16. The defining window therefore carries 2 x 2 block of pattern characters. Because of this, when you alter a pixel using the *execute* button, four pixels will be turned on or off. To the right of the defining window is a 4 x 4 block of the pattern you are defining, so you can get a better idea of what the finished pattern will look like. When you are happy with a new pattern you can drag it back to the upper window display and start on a new one. Once you have defined your new set of fill patterns, these can be saved by selecting the disc drive icon. The disc also includes two additional defined pattern sets (Fig 2).

UTILS

We now move on to the most exciting set of routines on the disc; the utility suite. On running the program you are presented with the Utils menu page, with a series of pull-down menus available across the top. Below this is a screen window, in the same position as in AMXart, headed with the name of the current file and the current mode. Initially the file name is set to "Untitled" and the mode is "Menu". The software writers, Elliots, have changed the way that the pull-down menus are used. According to the manual, this is to speed up the operation; personally I have my doubts. To access a pull-down menu you have to move the the cursor over the menu title required and press *execute*. 'Nothing new' you might say, but don't let go or the menu will disappear again. Holding down the *execute* button, move the mouse down and the various options will invert in turn. Once you are over the desired option, release the *execute* button and it will be selected. You will notice on some of the menus that a number of the options are printed in grey rather than in black. This is to indicate that these options are not currently available. If the select option requires further input (ie filename) or confirmation (ie clear screen) a small window will appear over the main graphics window. You are then invited to enter the required information or move the mouse over it to confirm or cancel the instructions.

In Menu mode you have the file options to load, save and name a screen (these are only available here) and quit which will take you back to the main menu. The edit options allow clearing of the screen and the goodies options give you the utilities Zoom, Copy, Curves and Icons. Having loaded in a picture created by AMXart you can then select one of the "goodies" (this term is pinched straight from Macpaint).

ZOOM

This is the most incredible routine of the options available. On selecting Zoom from menu mode you are presented with a similar screen with your original picture intact. To the right of the main screen window is a smaller window showing part of the main screen. By moving the mouse and pressing the *move* button, any part of the main screen can be inset into the small window. Selecting goodies again will display a new range of options; Zoom and Showpage. On choosing the Zoom option the main screen disappears and is replaced by an enlarged version of the inset screen. Each pixel is represented by a single character block. The *execute* button enables you to toggle on and off the pixel under the cursor, making it so easy to add detail to your picture. Once you are happy with the results, selecting goodies allows you to show the whole page again. In fact, AMS have made this procedure even easier, as you can toggle between the edit screen and the whole page by just pressing the *cancel* button. Also when in the edit screen it is possible to move the editing area by using the *move* button and dragging the editing area across the window.

This really is a most sophisticated utility and so simple to use. I would say it's worth buying this package just for this single routine.

Once you have finished the fine detail selecting quit from the file options menu (the only one available) takes you back to menu mode where you can save the picture or select one of the other goodies.

COPY

This is another useful utility that allows you to copy areas of the screen to another location. The goodies menu gives various options to rotate or produce a mirror image and the effects menu

CONTINUED OVER

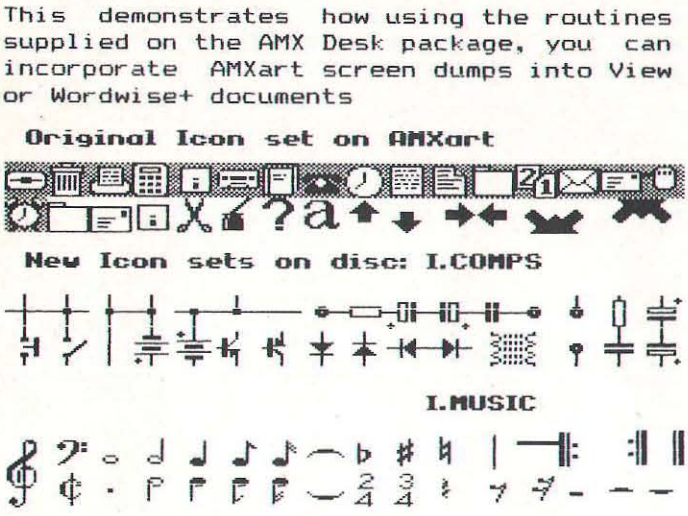


Fig 1 Pre-prepared icons now available

controls how the copy is placed on the screen (ie over, invert or wipe).

To set the area to be copied you move the cursor to the top left hand corner, hold down the *execute* button and drag out a rubber band rectangle. Releasing the *execute* button sets the area. Now using the *move* button and the mouse you can position similar sized rectangle over the area you want to copy to. Having done this, selecting copy from the edit menu will begin the rather painfully slow copying process. Once the copy is complete you are give the option to confirm or cancel. If you look at Figure 2 you will see I created a grid to hold the new fill patterns. I created one grid on AMXart and then copied the other two. These took 3.75 minutes each to copy. Another problem I had was trying to position the copies accurately. I would like to see either a gridlock option or a slow mode. A nice routine which gives you a natural break to go and put the kettle on.

CURVES

This utility enables you to add smooth curves to your artwork. The goodies menu offers elipses or arcs and the effects menu gives the same drawing options as on Copy. Underneath the graphics screen are three option boxes. For Elipse they are *Centre, +Yrad and xXrad and for Arc they are *Centre, +Start and xEnd. By selecting the options in turn you can position the distinctive cursors on the screen using the *move* button. Once all three coordinates have been chosen a temporary dotted line is drawn to show the curve. When the arc or elipse is in the right position, pressing *execute* replaces the dotted line with the final curve. Again the whole routine is very simple to use. There are slight limitations though, as the elipses can only be drawn in the horizontal or vertical planes. Also I would again like to have seen use of gridlock and slow mode to aid accuracy.

ICON

This is the last function of the Utils suite. With this routine you can add pre-prepared icon to your picture. The file menu now includes the load icon option, which will load an icon file and display it under the main screen. Having selected your printing effect the *move* button is used to drag an icon on to the graphics screen. Gridlock is in action by default here, so it is very easy to build up a large picture using icon blocks. It is, however possible to override the gridlock by holding down the *cancel* button as you release the *move* button to deposit an icon.

Unfortunately, once you have released the *move* button you are unable to pick it up again. Confirmation of position by using the *execute* button would have been a sensible safeguard.

AMS have also included further icon sets on the disc for those of you with musical or electronic bents (see Fig 1).

SHOW OFF

There are three other utilities on the disc to help show off your artistic talents.

Xdgen can be used to generate Xdump routines using sideways roms, such as Printmaster and Dumpout 3, for use with the User print option on AMXart. It will only allow you to call one *command, which can be a bit restricting if you need a separate command to define a screen window. In the hints and tips section I have listed another generator program supplied by AMS which is a bit more flexible.

Slides is a neat routine to set up a slide show of your favourite works of arts. You are allowed up to 25 slides, which can be set to be displayed automatically with a user defined delay or manually using the *execute* and *move* buttons to advance or backtrack. Basic I users will have a problem here — see later for the cure.

Strip is a simple routine which strips off the AMXart menu surround from a saved picture, cen-

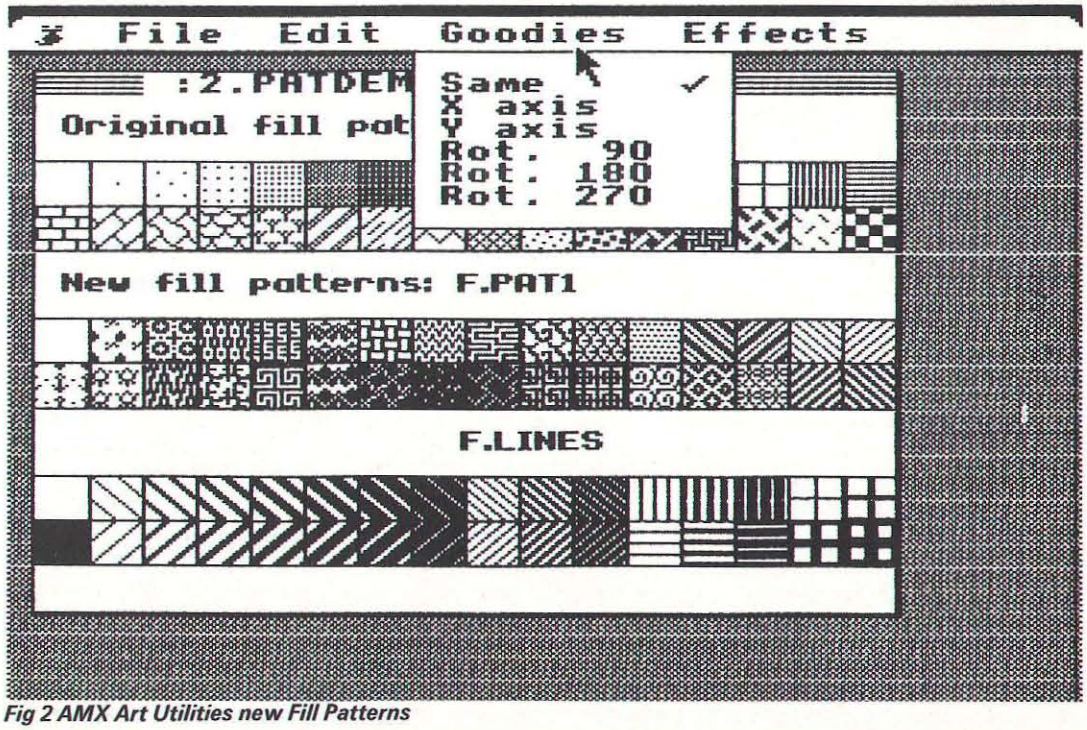
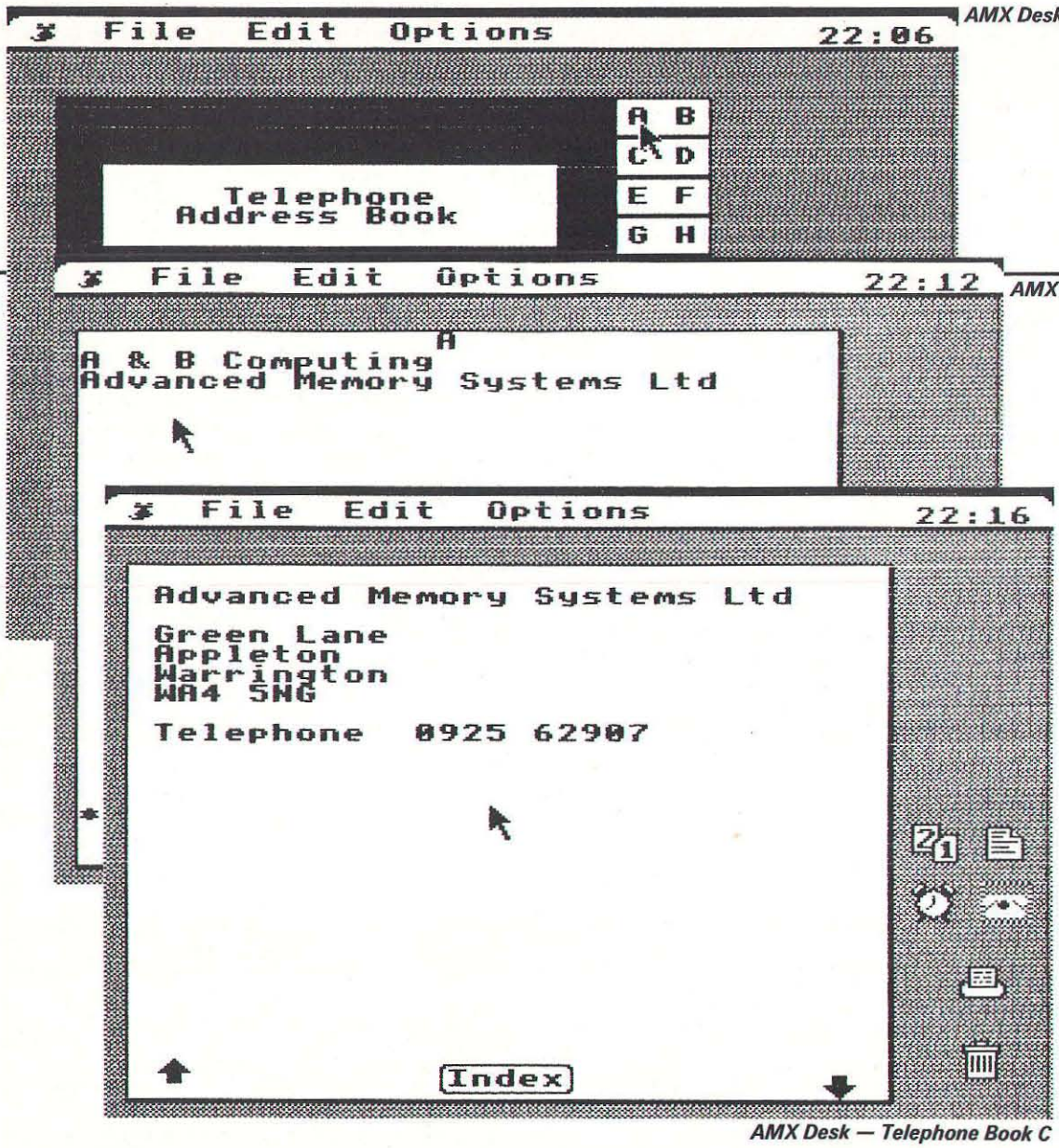


Fig 2 AMX Art Utilities new Fill Patterns



AMX Desk — Telephone Book A

AMX Desk — Telephone Book B

AMX Desk — Telephone Book C

tres it up and saves it back to disc again. This is very useful if you are wanting to create a title page for your own program.

SKETCH

And now for something completely different. Well, it's got nothing to do with AMXart. AMS have included a very nice program which lets you play around with the mouse in colour. The program uses mode2, so eight colours are available to you. AMS have refrained from using the flashing colours. Obviously it hasn't got the same facilities as AMXart, but they are not bad. A small selection of icons appear on the bottom of the screen allowing you to select the colours and the drawing mode. It includes rubber band line and box drawing and circle and fill routines. You can also save to and load from disc.

Well that completes the offering from the Art Utilities package. What a wealth of facilities, especially Zoom and well worth the £14.95. However, it is a shame, especially as a revamped AMXart is included on the disc, that the Utils suite was not fully integrated into AMXart. How nice it would be if you could call the routines directly without having to first save the screen, run the utilities package then load back in the screen. Then if you want hardcopy it's back to AMXart again. But I shouldn't detract from this excellent package. A definite must for all mouse users.

COLOUR ART

Before I look at AMX's other package, I will cover the Watford offering as it provides another facility for AMXart users. Colour Art provides the ability to colour in AMXart pictures. The program is supplied on disc and comes with a nine page manual which, although short, covers all you need to know. The program is very straightforward to use and will be virtually second nature to regular mouse users.

On booting the disc the program loads a full colour picture of the AMX mouse. In place of the icons and fill patterns of AMXart, you have a selection of four primary colours down the side and 16 colour shades across the bottom, with a current colour box on the end. These shades are obtained by dithering (pixel mixing) the four primary colours. The manual states that you have up to 255 shades available.

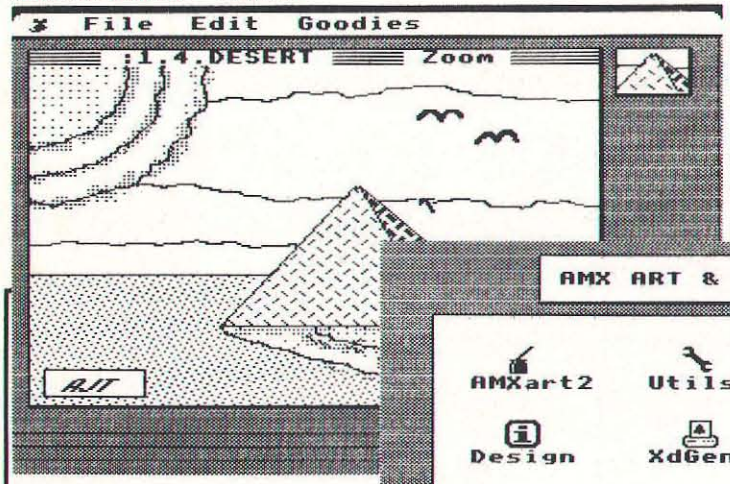
Across the top of the screen are the words "filing system". Pressing the *execute* over this will reveal the menu options; load, save, *command or abort. Selecting load prompts for the drive number and then the mode. AMXart screens are mode 4 whereas screens saved from Colour Art will be in mode 1. The program uses the protocol that mode 4 screens should be in directory 4 and mode 1 screens in directory 1. It is therefore neccessary to make sure you save your AMXart screens to directory 4 or *rename them before using Colour Art. If you are loading an AMXart drawing, the program automatically converts it to mode 1. All screens saved from Colour Art are put into directory 1 by default.

Colouring with the program is very simple. Having selected a shade from the 16 currently available, the basic cross-hair cursor is positioned over the area you wish to fill. Pressing the *execute* button will fill the area with the selected colour. The fill routine is more intelligent than on AMXart, so it is possible to colour the more open fill patterns available on AMXart. However, it is not foolproof, and gives up at the most unexpected times. A beep is sounded when it has finished trying to fill an area or if you try to fill area that is already coloured.

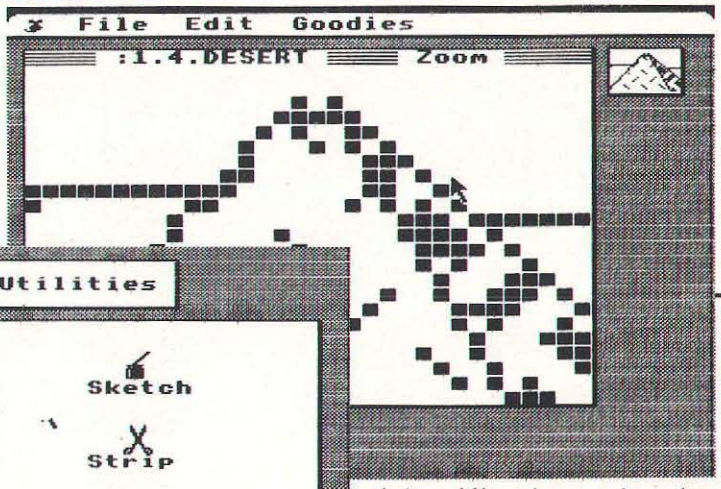
As I mentioned earlier, there more shades available than those shown in the 16 boxes. By pointing to the current colour box and pressing *execute* the, full colour palette will be displayed on the screen, with your picture being temporarily saved. You then move the cursor over the new shade you want and press *execute*. This will transfer the shade to the current colour box. Now move to one of the sixteen shade boxes and press *execute* again and the colour moves to that box. In this way you can select any 16 of the 255 shades displayed. Pressing *execute* over the current colour box again, will return your picture so you can continue colouring with the new shades. If this isn't enough shades, you can also change the primary colours by moving the cursor of one of the primary colour

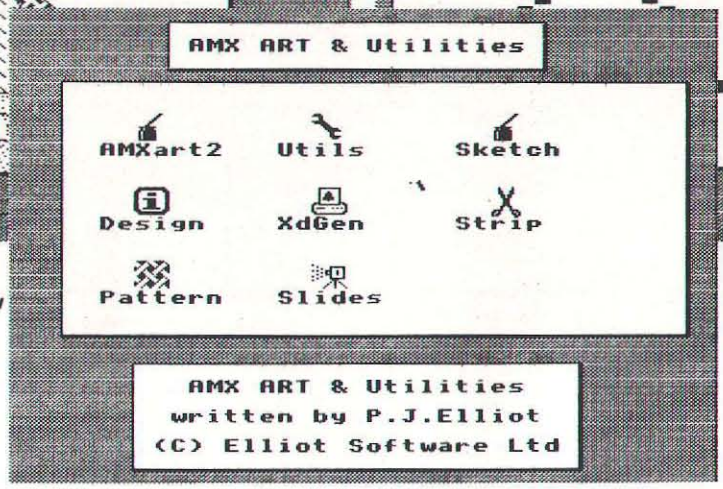
CONTINUED OVER

AMX Art Utilities — Zoom A



AMX Art Utilities — Zoom B





AMX Art Utilities Menu

boxes and pressing *execute*. The colour will then cycle through the standard BBC colour palette. Each primary colour can be changed in this way. The *cancel* button can be used over the primary colours and the shades to return them to their default states. One aspect I did find disappointing was that there is no check performed to make sure you don't end up with the foreground and background colours the same, thus losing sight of where the primary colour boxes are. Also, when using some colours, the cursor merged into the background and it could be very difficult to pin point it's position.

If you do lose track of the command options at any time, pressing "H" will load in a help screen. This is a useful way of producing coloured AMXartwork, but at £13 plus VAT it doesn't provide good value for money when compared with the AMX art utilities. However, at the time of writing, Watford were offering it free with an AMX mouse, which can't be bad.

DESK TOP

AMXdesk is AMS's attempt at providing a desk top enviroment. On the whole they have succeeded, but in one or two areas there are failings.

The software comes similarly packaged to the art Utilities with a user guide of some 24 pages. Again, this is well laid out with lots of example screens. Before using the package AMS recommend that the disc is backed up. For 40 track owners ***BACKUP** will suffice, whereas 80 track owners should use the program provided on the disc.

Once you have your working copy you should **CHAIN "SETUP"** which will create a file on the disc with information about your system. Now you are ready to go. Booting the system for the first time during a session will prompt you for the time and date. Providing you don't switch off or perform a hard break, the Beeb will remember this info. You are then presented with the main menu screen.

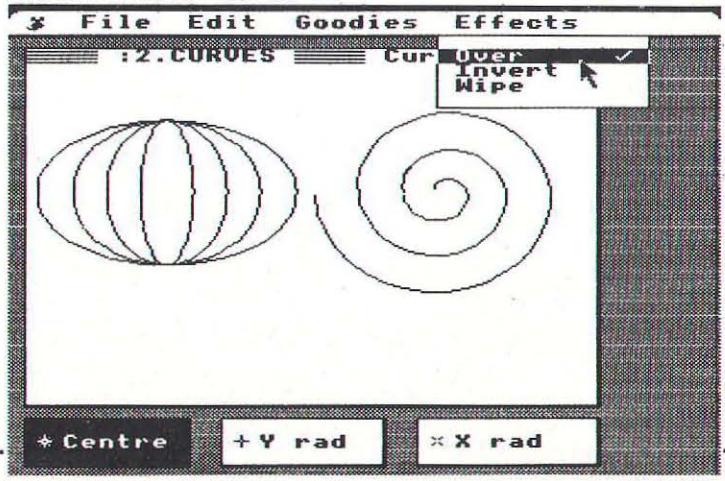
This follows a similar format to the AMXart software with a pull down menu across the top of the screen and icons down the right hand side. Figure 3 shows the layout after a disc has been catalogued, by pressing *execute* over one of the disc drive icons. By looking at the file execution addresses and at the file's directory, the program determines what type of file it is and tries to display an appropriate icon. When you move the pointer over a file name and press *execute*, the file name will invert and you will be able to use the *show info* option on the view menu. This gives more information about the file. If you use AMS's prefered directories, (ie P for picture, I for icons) the correct information will be displayed in the overlaid box. By pressing *execute* twice over a file name, the file should load and run. The exception is anything in directory S which is reserved as a system directory.

This is a very nice menu program and could no doubt be converted into a general purpose menu program, incorporating download routinesand so on.

Also available while with the Desk Top screen is the calculator, accessed from the mouse menu, top left. If you choose this option, a simple four function calculator, with a percentage key and a single memory is overlaid on the screen. It is operated by moving the mouse and pressing the *execute* over the appropriate key. One disappointing aspect is that there is no indication that you have anything in memory. It is also possible to copy an answer to a calculation to the clipboard file, to be pasted into the memo-pad or calendar later. The Calculator facility is also available when using the Telephone Book and for those using the second processor version all the time.

The three main programs of this package are Calendar, Memo-pad and the Telephone Book.

AMX Art Utilities — Curves



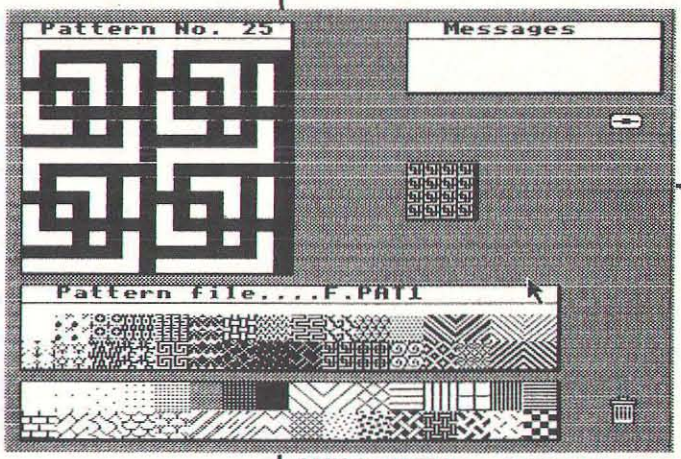
THE CALENDAR

On pressing the *Execute* button over the Calendar icon the program will load and run. You are presented with a monthly calendar display showing the current month and the following two. Any days where entries are recorded will be highlighted in inverse. It is possible to move the months displayed by using the up and down arrows at the bottom of the screen, and by pressing *execute* over one of the days, the information recorded for that day and the ensuing three days will be displayed. Alternatively you can enter data at the cursor position. This can be moved around using the *move* button. It is also possible to use the copy and paste options of the edit menu. This allows you either to copy an entry to the clipboard to be entered into a memo later, or to paste in an entry prepared in the memo-pad program. The space beside the date in between the two colons is for entering an alarm time. This is fine provided you have your Beeb switched on with this suite of programs running when the alarm is due.

At any time it is possible to get hard copy of the screen display by moving the pointer over the printer icon and pressing *execute*. This suite of programs uses two different dumps, one is a graphics screen dump and the other is just a straight text dump. This program uses the graphics dump on both displays. Once you have finished reading or updating your diary entries you can either return to the Desk Top by using the quit option on the file menu or use one of the other program icons.

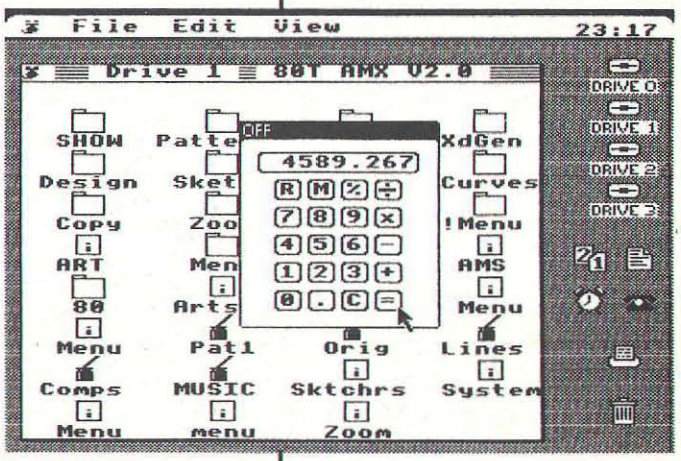
PROGRAM LISTING

```
 10REM   XDUMP generator
 20REM For use with Printmaster
 30REM   Dumpout3 & other Rom
 40REM
 50DIM xcom(7),xcomE(7)
100
110P%=&5000
120
130FOR pass=0 TO 3 STEP 3
131
132
140P%=&5000
150N%=0
160[OPT pass
170
180.xdump
190OPT FNoscli("CWINDOW")    \enter here any
200OPT FNoscli("GDUMP 1 3") \number of * commands
210
220RTS
230]:NEXT
250*SAVE XDUMP 5000 5800 5000
260END
270DEFFNoscli(A$)
280[OPT pass
290LDX £xcom(N%) AND 255
300LDY £xcom(N%) DIV 256
310JSR &FFF7
320JMP xcomE(N%)
330.xcom(N%)
340]:$P%=A$:P%=P%+LENA$+1
350[OPT pass
360.xcomE(N%)
370]:N%=N%+1:=pass
```



AMX Art Utilities — Pattern designer

AMX Desk — Overlaid Calculator



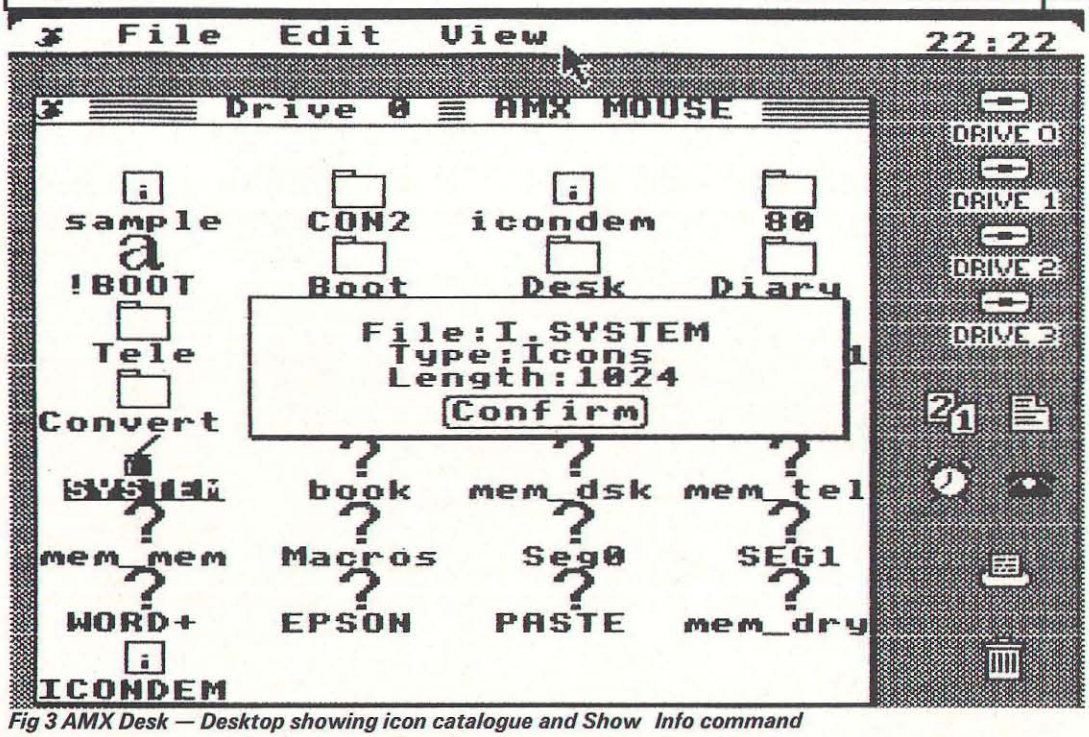


Fig 3 AMX Desk — Desktop showing icon catalogue and Show Info command

MEMO-PAD

This is possibly the most disappointing program of this suite. On loading you are presented with a blank screen, apart from the standard icons. Using the file options you can either name a new document or load in an old one. Basic I users will have problems here and should see the hints and tips section.

Once the file has been created you are presented with a blank page 1 with the cursor in the top left hand corner. The facilities are very basic, but all the same, very easy to use. You can move the cursor around by using the **move** button in conjunction with the mouse and change the page being worked on by using the up and down arrows at the bottom of the pages. You can also define an area to be worked on by using the **execute** button to drag out an

CONTINUED OVER

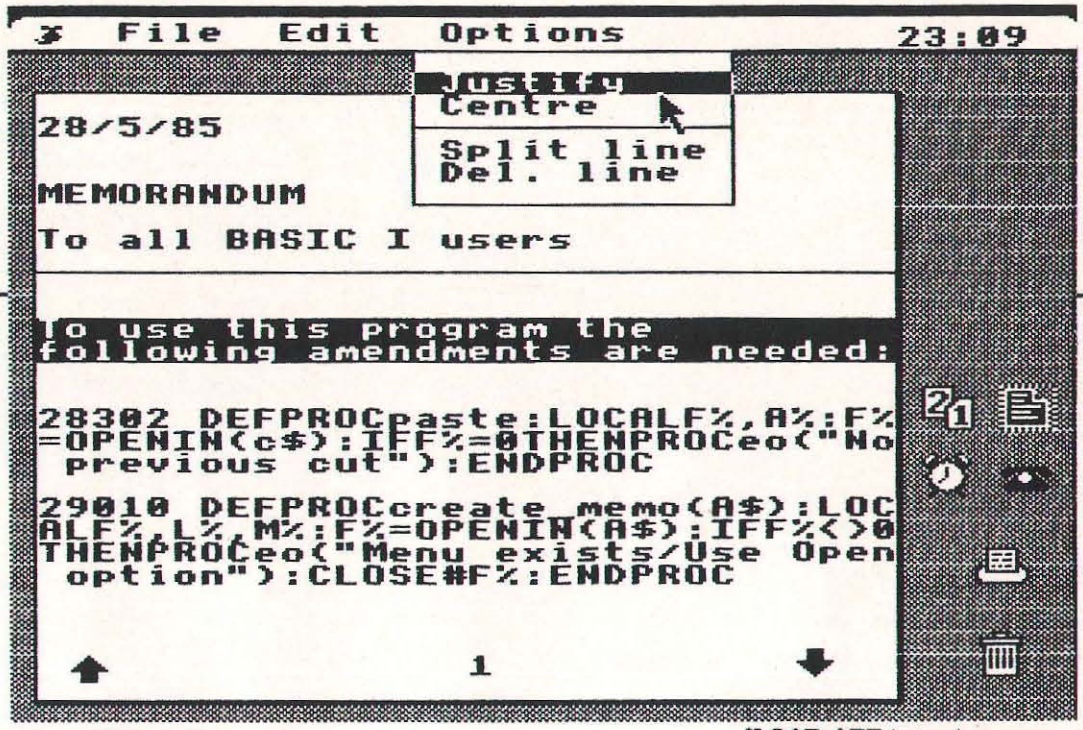


Fig 4 AMX Desk Memopad

inverted area of text. This will then allow use of the justify and centre options and the clear, copy and cut facilities from the edit menu.

Two other facilities available on the options menu are delete line and split line. Delete line I can accept as a useful facility but who wants to split a line? Another facility is the undo option. This is meant to aid preparation of standard memos by allowing you to recall the original format not including current amendments. This is achieved simply by loading back in from disc. Unfortunately, this does not work if your memo runs over into two or three pages, as on each change of page the disc file is updated. Think again AMS.

In fact, this whole program is frought with problems. You cannot cut or copy an area of text greater than 256 bytes without getting a "can't extend" error. If you paste text and don't leave enough room for it, it will wrap round over the last line, rather than moving onto the next page or at least creating an error situation. You cannot insert text at the cursor only overwrite. Thinks! perhaps thats why the split line facility was included. Split the line first then overwrite the spaces. Well, I suppose it works after a fashion.

Finally, the printout facility is hopeless. It is a simple text dump, but centred in the middle of standard 80 column paper. With only 24 lines of 32 column text they look quite pathetic. I would have prefered to see the graphics dump used.

TELEPHONE BOOK

This is one of the more useful aspects of the suite. Pressing **execute** over the telephone icon displays the front cover of an alphabetical telephone book. The options menu allows you to insert or delete an entry. My only grumble here is that you can't correct any entry you have made without completely re-writing the whole entry. Nevertheless, once you have built up a decent sized book, accessing it is a doddle. Using the **execute** button first select the letter. You will then find displayed all the names begining with that letter, select one of these and the full name and address will be displayed. Again, you can have a printout at any stage by using the printer icon. Also it is possible to copy a name and address to the clipboard for pasting into a memo.

AND FINALLY...

Also included on this disc, (I think purely because the wasn't enough room on the Art Utilities disc) is a very nice routine for incorporating AMXart pictures into View or Wordwise Plus printouts. I have only tried the Wordwise Plus version which works a treat, see Figure 1. The routines are very simple to use and automatically take into account the dump size if printing out in paged format.

All in all, I wasn't overly impressed with AMXdesk which is a shame as the writers, Elliot Software, have shown what they can are capable of with AMXart. I am of the impression that this whole package has been rushed — more time and trouble in adding polish to the package would have cured most of my grumbles.

That said, I also wonder who is really going to buy this package. For the business man it just hasn't got the facilities of dedicated databases and word processors. For the home user it loses a lot of its potential if it's not up and running all the time. The only use I can see for it is to impress all those friends who want to know what your computer can do (or to make QL users jealous).

VERDICT

Art Utilities is a definite must. Once you have seen the Zoom facility you will know what I mean. I am sure AMX must have got the prices mixed up, as AMXdesk might be worth considering at £14.95 and the Art Utilities would still be a good buy at £24.95. As for Watford's Colour Art, well I wouldn't say no if it was being included with a Mouse gratis, but I would have to think twice before paying out the same amount for this as for the AMX Art Utilities.

HINTS & TIPS

AMXart: The bug in the original program can be cured by using the following routine:

***RENAME ART OLDART** (return)
***LOAD OLDART** (return)
?&1ED2=&60 (return)
***SAVE ART 1900 4D00 1903** (return)

To create a version of AMXart with different fill patterns do the following:

***LOAD ART** (return)
***SAVE FILLS 4800+400** (return)

You can now enter the Design program and load **FILLS.** The last eight icons are the fill patterns. Redesign your fill patterns, making sure not to alter the blank square, otherwise you will lose the rubber. Save your new patterns as: **FILLS2.** Then:

***LOAD ART** (return)
***LOAD FILLS2 4800** (return)
***SAVE ART2 1900 4D00 1903** (return)

Now *ART2 will run AMXart with your new fill patterns. If you buy the new utilities suite you can ignore these surgestions.

Screen dumps AMXart allows you to add your own screen dump routines by creating a machine code dump to run at &5000. This should be called "XDUMP". Listing 1 is a short program that allows you to incorporate a program to call a sideways ROM dump routine. It is possible to have a number of "XDUMP" routines on the same disc by filing them in separate directories. Then by issuing a ***DIR** command before invoking the user print option you can choose which type of dump you want.

BASIC I Both of AMS's new packages have problems for the Basic I user. See Figure 4 for the corrections to the "Memo" program. Also in AMXdesk, the Convert program uses the pseudo-operators EQUS and EQUB in lines 810-830, which need to be altered to use the indirection operators. In AMX Art Utilities, the program "Show" has an OPENIN problem like the "Memo" program. Line 570 should read:

570 F%=OPENINA$: IF F%=0 ENDPROC

If anyone has any hints or tips on using the mouse or has written some software please do write in. And finally, somebody at AMS can't spell. Look at lines 28076 & 28080 of the program "Tele"...

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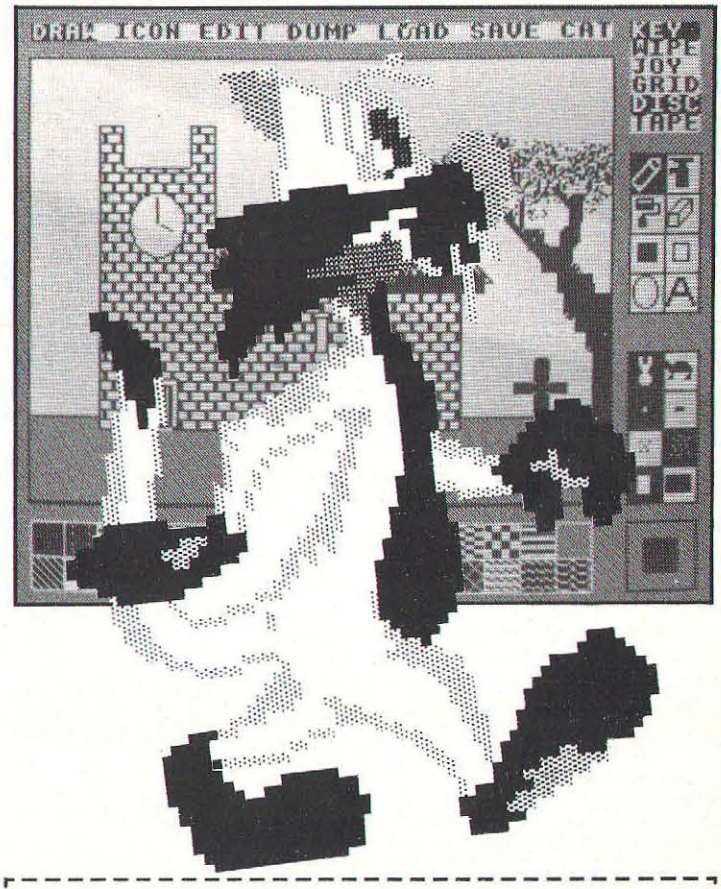

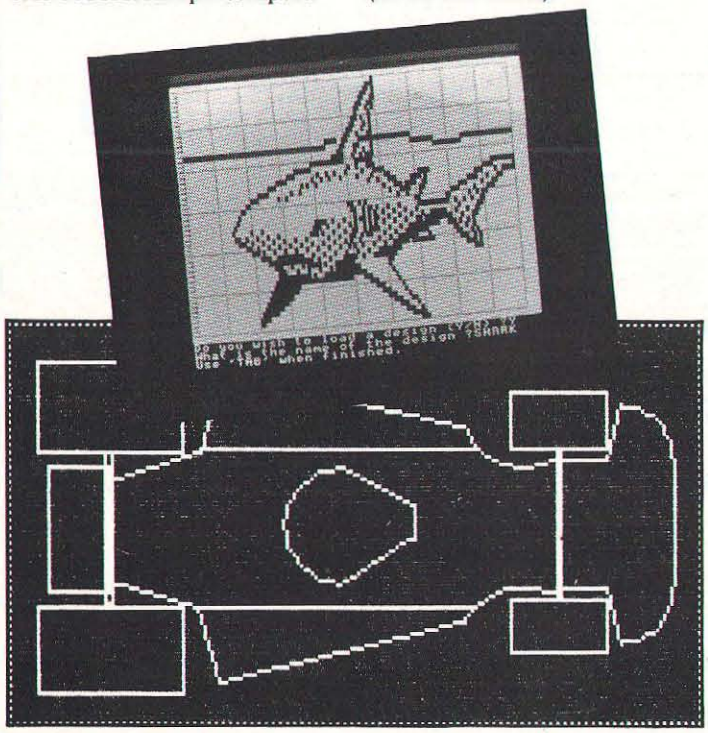

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Acorn's Superstore

Gordon Taylor

The Viewstore Database and the Winchester Disc System

Even though the Beeb is over three years old, it was obvious that the original Acornsoft disc Database was no more than a stop-gap. Their definitive offerring — ViewStore — has now arrived and is well worth the wait.

Many databases (like StarBase or FilePlus) are menu-driven — using the function keys, with "dynamic" labelling. They really require "road maps" showing the relationship of the various menus (such as I have provided in my reviews).

ViewStore also uses the function keys but — as in the rest of the View family — the key assignments are static and can all be shown on a function key card. This covers all the "interactive" operations. In addition, ViewStore is capable of "batch" operations (using utilities stored on disc) — all of which can be driven by EXEC files. These act as stored "programs" and enable the creation of custom systems. In many ways, it offers the best of both worlds, with ample help for the learner, yet speed and power for all users. ViewStore is the first Beeb database to enter the top of the four classes identified in my review of StarBase (A & B, October 1984) in that it offers 80-column displays. While it can benefit from either Shadow RAM or a Second Processor, neither are essential. Thus, it is competitive with many CP/M databases, such as FilePlan (which is bundled with the Acorn Z80 Second Processor) and others costing from £200 to £400. However, ViewStore offers only a "flat" file and so it is not suitable for applications requiring suites of related datafiles — such as accounts and/or stock control.

ViewStore cannot be used with cassettes but works well with Disc Filing System (DFS) floppy discs. Moreover, it is the first Beeb database designed to work also with the Advanced Disc Filing System (ADFS) — and hence with both Acorn double-density floppy disc drives (when they come) and the Acorn Winchester hard disc drives (which are available now). It will also work with the Network Filing System (NFS) used with the Acorn Econet file servers.

INSTALLATION

ViewStore comes as a 16K ROM and is installed in the usual manner in one of the ROM sockets (below the keyboard in the Model B). With this being the third member of the View family, and room also being required for the DFS (and the ADFS — when the Winchester is in use), it is easy to see why the new B Plus has six ROM sockets.

COMPATIBILITY

ViewStore is compatible with the BBC Model B, the new Model B Plus, and the Model B with a 6502 Second Processor, with the DFS, the ADFS or the NFS. ViewStore can make full use of add-on Shadow RAM boards — such as the Raven-20 — under the DFS. However, the present Raven-20 ROM software is not compatible with the ADFS (Twillstar Computers are looking into this). Although ViewStore is largely compatible with the older 0.90 DFS, changing to a 1.2 or later version will considerably increase both speed and reliability (as it would for other databases) and is recommended by Acornsoft.

ViewStore is also functionally compatible with the Electron, provided it has a disc drive. However, the maximum record length is less, owing to the least-RAM screen being Mode 6 (taking 8K) instead of Mode 7 (taking 1K), the lack of Shadow RAM and the use of the ADFS rather than the DFS (PAGE is higher). To install the ROM, a ROM board (such as the Slogger) or a cartridge-base would be needed. Even then, the function key assignments would differ from those on the Beeb and you would need to copy the utilities onto a 3.5 inch disc. Against this, ViewStore is about the only ROM-based database that will work on the Electron and the ADFS-controlled floppy disc system offers functional advantages and larger datafiles than on the Beeb at present.

CONSTRAINTS

The maximum field length — for alphanumeric and text fields — is 239 characters and the maximum field number is 254. These are more than adequate but ViewStore is importantly different from other databases in that the field length can be greater than the display width — thanks to the ability to scroll in the field "window". Hence the record length can be much more than one Mode 7 screen (as in StarBase) or 3 (as in FilePlus) or 4 (as in Merlin) or even 6143 characters (as in DataGem).

The absolute maximum record size is about 60,000 bytes. (Bytes describe data characters, any free space and field and record separators etc.) However, in reality, the record size is constrained by the maximum available memory. When using the DFS, this is :

1 For a Model B, about 5,000 bytes in Mode 0 and about 24,000 bytes in Mode 7.2 For a Model B with Shadow RAM (or a B Plus), about 25,000 bytes in any Mode. When using the ADFS, these are reduced by about 1500 bytes.
3 For a Model B and 6502 Second Processor, about 30,000 bytes in any Mode with any filing system.

Moreover, the records in a ViewStore datafile can vary in length — which means that disc storage efficiency can be far higher than with the more usual uniform length records.

The maximum size of a ViewStore datafile is an amazing 4,096 MB (which should certainly allow for any likely future expansion !) The actual size is dictated by the disc or disc filing system capacities for single files (see later) This is of special importance for ViewStore, since the datafile can extend over only a single logical drive. Some other Beeb databases allow the use of multiple surfaces (StarBase 2, DataGem 4 and FilePlus 4) — of up to 800 K in single density. However, after allowing for other files, ViewStore will permit a datafile of similar size (on a floppy disc) when using the ADFS and double density recording.

The maximum number of records can be as high as the maximum theoretical file size (of 4,096 MB) divided by the average record length. This means that it is at least 143,000 — and may be far higher. Again the disc or disc filing system capacity for a single file is likely to set the limit in practice.
The maximum number of indexes that can be kept up-to-date are: DFS — 4, ADFS — 9, and NFS — 4. Additional read-only indexes can be created — up to the number of fields. This reduces the maxima for up-to-date indexes by one.

FILE CREATION

ViewStore is entered by typing *STORE. Like FilePlus, it has no provision for using passwords to limit access (as have StarBase and DataGem). In any case, only DataGem files are encrypted. The screen foreground and background colours can be reset from Command Mode (as in View and ViewSheet etc) by pressing — eg Ctrl-S 7 2 0 0 0 for green on black.

ViewStore uses several directories: D for datafiles, F for format files (databases and reports), I for index files, R for report definition files, S for select files, and U for utilities.
With the ADFS and NFS, they must be created before use — whereas this is not necessary for the DFS.

The PREFIX command is usedto distribute the D, F, I, S, and U files between the various disc surfaces/drives in a multi-drive set-up. It can also allow the ViewStore utilities to be held (once) on a separate directory under ADFS,

and accessed from many other directories, each holdingseparate databases. PREFIX commands must be re-entered at every session, but can be put into an EXEC file (see later).

When creating a new datafile, you must either adapt an existing format file or use SETUP to create a new one. SETUP also allows you — when using the DFS — to lay out your available disc surfaces with empty files of suitable size, to allow several to be open at once, with less chance of getting "Can't Extend".

SCREEN DISPLAYS

ViewStore has two data displays — Card and Sheet. All the fields in a record are listed in a record format, together with their display widths etc — which apply to both data displays.
Field numbers can be used instead of fieldnames throughout ViewStore. This enables fields to have no names which need show on card display — yet still be referred to for SELECT etc.

Sheet display is a spreadsheet — with fields in columns and records in rows. The number of records read in is set by the Capacity parameter in the database header. The default value is 50 but it can be set lower. The trade-off is the number of disc accesses needed — eg when scrolling up and down the datafile.

Card display is limited to a single screen, but this too can use any screen mode — including 80-columns. The field layout is composed using an in-built editor, which works in a "pick and place" fashion. In card display, only as many complete records are read in as will fit on the screen. The cursor keys allow stepping around the datafile in either display — both by single fields or records and to the first and last fields or records.

Any number of alternative record formats are allowed for each datafile — eg to show different fields at different display widths — and each is stored in a separate file. Multiple format filenames could be stored on the function keys (using an EXEC file) for easy recall. Also any part of the record (up to the whole) can be output via the REPORT utility — to screen, printer
or spool file (see later).

DATA ENTRY

The datafile title is displayed on the first line. This can usefully include the date of creation or last modification.

Data validation is very powerful. As well as data type — alphanumeric, text, numeric, date and American date — it can also be compared with any low and high limits and/or with any value list (which can include wildcards). Excellent prompting on the third line defaults to the fieldname, but can be up to 79 characters instead. It can be used to expand on the field name and explain
any limits or value list etc. A function key can be set up to input repeated fields or even whole (default) records — up to the buffer size limit of 256 bytes.

INDEXES

ViewStore is capable of direct random access via multiple indexes (as opposed to the single hash-coded key field of StarBase and no indexes at all in DataGem). Moreover, among ROM-based Beeb databases, it shares only with Merlin the ability to maintain such
indexes up-to-date during the addition or amendment of data. However, ViewStore is unique in exploiting the various filing systems to the full.

ViewStore can maintain up to nine indexes up-to-date (depending on the filing system in use) compared with onlyseven for dBase II. Furthermore, ViewStore also has an INDEX utility which can be used both to re-build such indexes and to create read-only ones. In the record format, these are set by Y and R respectively.

By this means, every field can be indexed if required. Moreover, INDEX
allows you to respond to the prompt "Fieldname ?" with the multiple wildcard (*) which results in indexes being built automatically for every field marked with Y or R. Indexes can also
be created on selected subsets of records (see later).

More than one index (but only read-only) can be created per data field — simply by having additional fields in the record (just to carry the pointer). The maximum index key length is 105 characters, but is usually 10 or less.

The maximum number of files per drive is 31 for the DFS and number per directory is 47 for the ADFS. However, the number of indexes can still be up to 254 — by changing between multiple
discs for floppy systems or using pathnames, with multiple subdirectories in directory I, for Winchester systems. Typically, different groups of indexes would be set by Y or R in different
record formats — which also carry non-zero display lengths for their respective fields.

When you press a function key to Change Index, the indexed fields shown on the third line are those set by Y or R in the current record format. On entering a fieldname, part of the
datafile is read in again and the screen message changes from the default of "Ordered by entry" to "Ordered by ‹fieldname›". On entering a search value, the cursor goes to the actual or nearest-above value in the field — a very good feature. The card display is much faster for indexed access, in that fewer records need be read, and there is generally less to write to the screen.

Upper and lower case are equivalent throughout ViewStore — both for commands — eg PREFIX — and for searching, sorting and comparing — eg fieldnames and values. It is also possible to
shorten fieldnames, ending with a multi-character wildcard (*). You only need enough characters to avoid ambiguity.

With up to nine indexes maintained, and the possibility of every data field being indexed at least once, access to ViewStore datafiles can be both unusually comprehensive and fast.

SELECTING

In addition to indexed access, ViewStore datafiles may be searched sequentially. Numeric, date and alphanumeric fields expect an exact match — though wildcards may be used. They may also be searched with leading and trailing wildcards, in an INSTRing fashion. Text fields however, are searched on a word or phrase basis. The data type can easily be changed in the record format — eg from alphanumeric to text etc.

In the SELECT utility, selection criteria take the form: fieldname, operator, value. In response to Fieldname ?, the multi-character wildcard (*) alone, allows the searching of all fields while, when combined with other characters, various groups
of appropriately-named fields can be searched. ViewStore (like FilePlus) offers all six comparison operators, as well as AND and OR. In selection criteria, value can be anything which might match the contents of a field (including wildcards). Hence the value
1000 will match 1000 in a numeric field, an alphanumeric field or a text field. Complex combined selection operations can be controlled by using brackets.

Unlike StarBase and DataGem, ViewStore is not always aware of the number of records in a datafile (a good check on data integrity). However, this is returned after SELECT, so you can always
use it and apply no criteria, just to count the number of records.

The SELECT utility can be used to select and sort (on one or more fields) a subset prior to using any of the output utilities — REPORT, LABEL, MACRO, LINK and CONVERT (see later). The total key length for sorting can be up to 250 characters and the number of fields is unlimited.

When using SELECT repeatedly, intermediate subsets can be saved (for later recall) by renaming them from the default of S.‹datafilename›. Actually, SELECT is so fast that this is rarely
justified. Also, since SELECT can be "driven" by an EXEC file (which itself may be editted — eg in View), the search history can easily be saved for later use. For example, it can be printed
out, to be attached to any corre-

CONTINUED OVER

sponding list of records produced by REPORT.

Sequential searching in ViewStore is similar to that of FilePlus and DataGem — and hence fast — in that records are read in up to 50 at a time, rather than singly, as in StarBase. Also, in ViewStore (like FilePlus), you only have to search the actual extent of the datafile and not (as in StarBase and DataGem) the full initialised length — some or much of which could still be empty. Sorting in ViewStore is much more powerful than in FilePlus, StarBase or DataGem — to greater depths, over more fields at once and over more records.

REPORTING

The REPORT utility has a default output format for simple listing of the records in horizontal lines, including the display width of as many fields as will fit. Output may be to screen, printer or spool file. Any number of additional report formats may be defined, and stored under separate filenames. They can be up to 158 characters wide and include any width of any fields in any order over any number of lines — together with any background text.

Calculations can be performed — using +,-,x,/ and brackets — on numeric field values, numeric constants and registers. Much as in View, two of these last contain the current record number (in the datafile or subset) and the current page number, while up to 24 more are available to hold any intermediate arithmetic expressions. In particular, registers can each hold both the subtotal and total of values of a field — for output at appropriate points in the report.

For printer control and highlighting, the manual mentions loading of printer drivers (as for View and ViewSheet). It is also possible to issue printer control codes directly from command mode. For example, to set condensed for an Epson printer, you type Ctrl-B, Ctrl-A, Ctrl-O, Ctrl-C.

The calculation facility of REPORT can also be used to update the datafile automatically. This enables you to "increase all prices by 10 percent" or to add the values of two fields together - even putting the result in another field. Rather than being printed, the output is written to a SPOOL file, which is then restored to the ViewStore datafile format by using the IMPORT utility (see later).

CONVERTING DATAFILES

Since it is usual to save records with some 20 or more extra bytes, data or even fields can be added to existing records. Fields can also be added to existing datafiles by using CONVERT. This is another very powerful utility to:

Select and/or re-order the fields
Select and/or sort the records
Increase/decrease the disc space for each record
Release the disc space used by deleted records

IN USE

When using the DFS, the format and data files can be left locked — to guard against accidental erasure or overwriting of a "read-only" database. With the ADFS however, you must be more careful. While the format and data files can be locked against erasure, they must be left open for writing in order to load and so are vulnerable to accidental overwriting. It is thus even more necessary to keep backups. There is a facility (on a function key) for deleting records, but none to "undelete" or restore a record (unlike eg StarBase and dBase II).

As with most database programs, you need to take care to exit properly (to complete writing back to disc). If you should switch off in the data or format displays, thus corrupting the files, it may be possible to recover at least some records using CONVERT or IMPORT.

IMPORTING

The IMPORT utility works on a simple ASCII text file and is very powerful. It will handle both fixed length records, even without field separators, and variable length records, provided that there are distinct field separators. The responses for IMPORT are given in the manual for the Acorn (Disc) Database and for the Ashton-Tate dBase II. I also managed to use it to import a list of DATA statements from a BASIC program (with the help of View for Search and Replace).

EXEC FILES

The function keys may be set up with utility filenames — for access in Command Mode. These may be loaded using an EXEC file, which itself could be capable of being auto-started, by naming it !BOOT.

The "key presses" used to call — and in the responses to — the utilities can also be stored in EXEC files, which act as "programs" for routines which are needed repeatedly. Although *BUILD could be used at a pinch, it is easier to use a word processor (such as View), since this enables editting. Such ViewStore EXEC files may be essentially unlimited in length. In contrast, FilePlus program files are limited to some 1600 characters and DataGem command files to the 256 byte capacity of the function key buffer.

VIEWSTORE MANUAL

The manual is in the somewhat unusual sequence of "Using" before "Creating" the datafile. There is some logic in this however, in that the utility disc includes a database "CARS", on which to try out the facilities. Also, it may well be, especially for larger or more complex databases, that the "user" may be quite other than the "creator". This apart, the manual (again by Information Transfer Ltd) is well up to the usual high Acornsoft standard. A reference card is also supplied.

PERFORMANCE

As indicators of performance, with the Acorn DFS 1.2 and an 80-track floppy disc:

a) indexed searching in card display is essentially instantaneous - ie under two seconds.
b) sequential searching is fast — eg 344 records occupying 24 K in 25 seconds. c) building an index is acceptable — eg 344 records, 1 field, 2 character key in 6 min 11 secs.
d) sorting is fast — eg 344 records on 1 field with a 6 character key in 1 min 37 secs.

The timings for most database operations depend largely on the disc system. Thus, starting with a single-density (FM) floppy disc, a double-density (MFM) floppy disc is faster, and a Winchester hard disc is much faster still (see later).

THE WINCHESTER DISC DRIVE

The manual says that the Winchester drive must stand horizontally. This means that it requires quite a lot of desk space, since it is 34 cm wide (more than twice that of a floppy disc drive), 10.5 cm high and at least 42 cm deep — allowing for the power and signal lead connectors. Two signal lead sockets on the back, labelled "IN" and "OUT" allow "daisy-chaining" of any additional Winchester drives (up to four are possible with the ADFS). While there was no indication of whether IN or OUT should be used, they are in fact interchangeable.

The drive spins the hard disc (actually two double-sided "platters") at some 3000 rpm — some 10 times as fast as a floppy disc — and continuously. This helps to give the higher data transfer rate. However, with its cooling fan, the drive is noisier than the Graduate that I had been using immediately beforehand.

One way of regarding a Winchester of 10 MB is as equivalent in storage capacity to : 100 DFS single-sided 40-track floppy discs of 100K each or 50 DFS single-sided 80-track floppy discs of 200 K each or 15.7 ADFS double-sided floppy discs of 640 K each.

This is particularly relevant to ViewStore, since its datafile can extend over only one logical surface. Hence the 10 MB Winchester

lengthens this by the above numbers (neglecting the space taken up by other files). In addition, (compared with an 80-track floppy disc), it provides an average seek time of 85 (versus 1200) milli-seconds and a data transfer rate of up to 1 (versus 0.25) MBit/s – which significantly speeds up disc operations.

THE ADVANCED DFS

Whereas the file catalogue of the DFS is limited to 31 files per drive, in a single level, that of the ADFS permits up to 47 "objects" per directory. Since these may be either files or themselves directories, the catalogue has a multi-level (up to 127) "hierarchical", or tree, structure. Also, while the DFS allows one character for directories and up to seven for filenames, the ADFS allows up to 10 for either. When expressed in full, the latter comprise the "root" directory ($), followed by all the directories leading to the file in question – and are known as "pathnames". However, any directory may be selected as current, so shortening the pathnames required – often just to filenames.

The ADFS uses contiguous allocation and so runs faster than the dynamic block allocation and linked lists of CP/M and MS-DOS. Equally importantly, this avoids the dreaded "Can't Extend" of the Acorn DFS and enables just one logical drive (such as a Winchester disc) to support several open files – not all of which can possibly be the last on the disc. Hence the ADFS supports up to 10 open channels and PAGE defaults to &1F00 (versus 5 and &1900 with the DFS).

The ADFS thus has similarities to MS-DOS (see Graduate With Honours, A&B, June 1985, p 18). However, it has the great advantage of being held in a (16K) ROM, rather than having to be loaded from disc.

The ADFS can be used with floppy discs (as on the Electron with Plus 3) as well as with Winchester hard discs. The Electron uses double-density (MFM) recording, since a suitable disc controller – the Western Digital 1770 – is fitted (as on the B Plus). Moreover, the Beeb implementation is expected to use double-sided 80-track drives as standard, which are treated as single logical drives (as in CP/M and MS-DOS) – giving a capacity of 640 K.

The ADFS can control up to four double-density, double-sided floppies of 640 K and up to four Winchester hard disk drives – of 10 or 30 MB (or more, in principle). The Winchester drives are allocated numbers 0 to 3 (or A to D) and the double density (MFM) floppy drives 4 to 7 (or E to H). With such vast disc capacities potentially available, it is hardly surprising that the maximum single file size with the ADFS is 16 MB (compared with only 256 K with the DFS, and 8 MB with CP/M).

With both the DFS and ADFS in the machine, it is very easy to switch between them – by pressing Ctrl-D Break and Ctrl-A Break respectively. The ADFS has the very commendable property of "self-frugalizing" – ie it does not grab workspace (for file channels) and thus raise PAGE (to &1F00) unless and until it finds a suitable disc drive switched on. Thus the ADFS ROM can be installed – and the Winchester left connected – yet, until it is switched on, Ctrl-A Break will not bring up the Acorn ADFS screen message.

The ADFS includes all the familiar facilities of the DFS (often enhanced), plus additional commands for managing the hierarchical file structure. These were described in Another Plus for the Electron (A & B, June 1985, p 38).

In addition to the ADFS itself, Winchester disc drives are supplied with several utilities (on the disc as received). COPYFILES is for transferring single or multiple files between DFS floppy, ADFS Winchester and NFS Econet floppy or Winchester drives. BAKUP/1 and RTRVE/1 are for backing up data from the Winchester onto DFS, single density (FM) discs, and retrieving it again. They go beyond COPYFILES, in being able to transfer files, directories and complete "trees" that are too big to be stored on a single floppy disc.

In use, the Winchester disc requires a more methodical approach – eg in respect of backing up (due to the quantities of data involved, and hence the time that would be needed to key it in again). At the end of each session, it is good practice to move the read/write head to the shipping position – to avoid damage to the discs/platters when moving the unit – by typing *BYE. Actually, this is very quick and you soon get into the habit.

THE WINCHESTER MANUAL

This 122 page manual includes excellent explanations of both the hardware and software – with the usual one-page-per-command for the ADFS. Both Contents and an Index are provided.

PERFORMANCE

As an indication of performance, with the ADFS 1.3 and an Acorn Winchester of 10 MB (compared with the DFS 1.2 and an 80-track floppy disc):

a) indexed searching is even faster (than instantaneous !)
b) sequential searching is faster – by a factor of 2
c) building an index is faster – by a factor of 5
d) sorting is faster – by a factor of 2.5

CONCLUSIONS

ViewStore hasvery versatile display capabilities and will handle very long records (up to some 30,000 bytes in practice, versus 6143 even for DataGem). It will hold up to at least 143,000 records of this size – which makes it uniquely suitable for Winchester disc systems. The data is held in a single logical file, the maximum length of which is dictated by the filing system and the type of disc drive in use. Up to this limit, it may be lengthened as required.

Indexes can be maintained up-to-date automatically (up to the limits of the filing system) and any number (up to the number of fields) can be created manually. This maximises the searching of the datafile that can be via direct random access – and goes far beyond its rivals.

In sequential searching, ViewStore is comparable in speed with FilePlus, faster than DataGem and much faster than StarBase, and also more powerful than any of them. Sorting can be on multiple fields at a single command and to much greater depth (up to 105 characters per field, 250 altogether).

ViewStore uses output definitions to control printing or spooling and allows more flexible reporting than FilePlus, StarBase or DataGem. All can produce labels or short form letters without a word processor, and names and addresses etc for merging into a letter in View, using the macro facility. In addition, ViewStore is capable of writing numeric data to linking files, which can be read by ViewSheet.

As well as being controlled from the keyboard, ViewStore can be driven by *EXEC files which can be saved as "programs". This enables more complex operations to be carried out easily and without error as often as required. Custom systems can therefore be set up.

ViewStore achieves that highly desirable objective – of being powerful and easy to use, both on a casual infrequent basis and also repeatedly. The performance goes far beyond any other available for the single-processor Beeb – as well as of many CP/M and MS-DOS/PC-DOS databases. Since, at £59.80 including VAT, it is also far cheaper than either StarBase or DataGem, it represents a new peak of price/performance. It is available now from Acorn dealers.

The Winchester disc drive and the ADFS greatly enhance the facility and speed of use of ViewStore – as well as its maximum capacity. Together they out-perform many other hard-disc business database systems – and at a fraction of the cost. The Acorn Winchester Disc Systems cost £1723.85, including VAT for the 10 MB version and £2643.85, including VAT for the 30 MB version, and are available now from dealers.

Soft Sector

Software producers continue their search for a new winning theme or game design with varying success.

A strange coincidence of game idea occurs this month with Alligata's Nightworld and Ultimate's Knight Lore, already a hit and the middle release of a trio, between Sabre Wulf and Alien 8. In both, the player controlled character undergoes a strange transformation during the course of the game.

In Nightworld you are Lee Lance, the explorer and "as the day passes to night your body transforms from human to creature and you take on the mysterious powers of a mutant gargoyle."

In Knight Lore you are the Adventurer. For countless nights you have slept chained to trees to keep your deathly curse at bay on the journey to see the great wizard Melkhior. Guess what? After a poetic revelation at the court of Melkhior, the mist clears. "The moon has risen quickly and in the fullness of its cool blue light, I become a Werewulf..." And so will you if you play Knight Lore!

The game begins and you now have but forty days and forty nights to find the old Wizard and seek his help and magical instruction. And if you don't make it your tormented soul will become werewulf forever. Which is to be avoided if at all possible I reckon.

THE SAME BUT DIFFERENT

The art of the computer game is to produce the successful formula but somehow make it new. Knight Lore brings to the BBC Micro the fresh and visually exciting three dimensional animation of Ultimate's Filmation. The graphics are impressive in their execution and make the game fun to play. Being able to climb stairs, jump on and off objects, walk through doorways into new rooms and dodge objects in 3D is a new experience.

Although standard building blocks have to be employed, Knight Lore possesses a whole host of spinning spiky spheres, portcullis fences, sliding blocks, false floors and automaton nasties. There's lots to jump over and onto, routes to learn, and objects to retrieve, not to mention the metamorphic change!

It's easy to get round the cavernous Knight Lore, to see what's going on but not so easy to win. You have to exercise the grey matter to define your goals as well as achieve them. And it looks so good! The metamorphosis is straight out of the best Jekyll and Hyde movies and the Werewulf is so cute. It's sometimes hard to keep your mind on the job in hand. Controls are mighty simple and it's fun just traversing some of the rooms by skillfull manipulation of the Adventurer. It's very easy to get totally wrapped up in the exploration of this 3D world, disappearing briefly behind blocks of stone, scuttling through rooms infested with deadly monsters, vaulting parapets and leaping from balconies in search of the potion or the cauldron. And only twenty days and nights left!

In contrast, Alligata's Nightworld is a conventional platform game. The BBC and Electron games are on sides one and two of the tape and each will run on the other if you so wish. ????DIFFERENCES???

The graphics are a colourful mix of Mode 2 shades but are very similar through a number of screens, some combinations of floors being more difficult than others. The screens are also plagued by some ugly harpies and other energy draining objects.

Unfortunately the rather ordinary graphics and unclear scenario leave Nightworld in limbo. You are exploring the underworld in search of the Golden Fleece (why?). The Fleece will finally be achieved by the means of various objects you collect in the vaults. Poor old Lee Lance is subject to a curse (of the demon lord perhaps?) and so is subjected to the inconvenience of turning into a gargoyle as day passes to night. I wonder what the weather is like in the underworld. Actually the gargoyle is much more capable of leaping about the vaults than Lee.

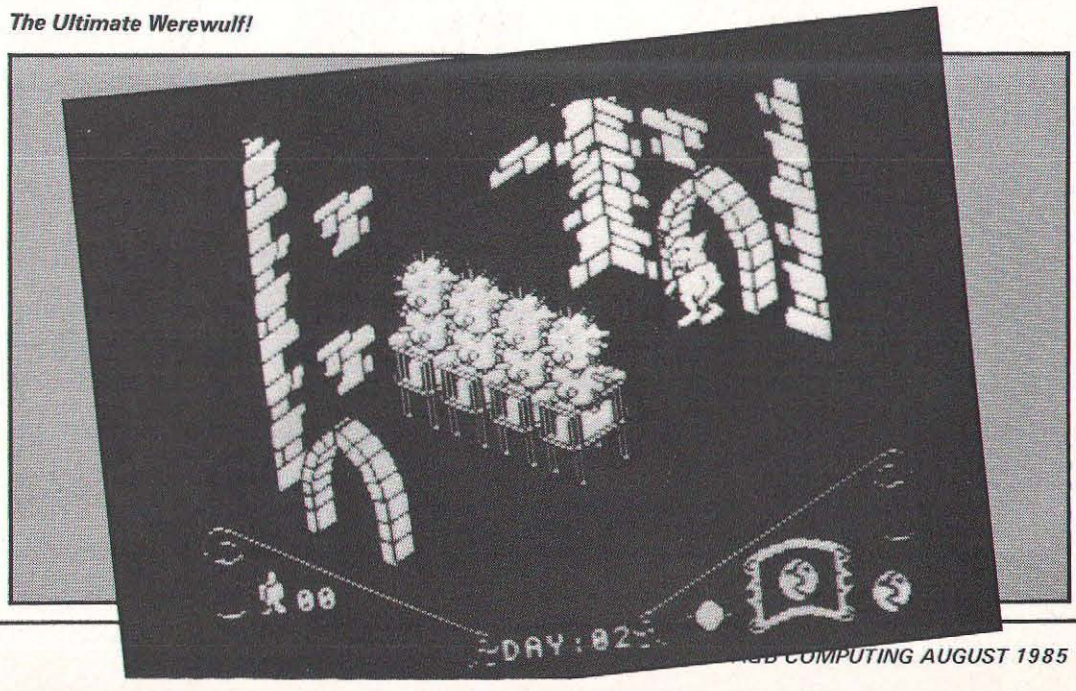
Nightworld lacks the magic which makes you want to keep going back, although if you are willing to slug it out with the dreary underworld graphics, there are some challenges to your game skills. Although "joystick compatible", Nightworld doesn't automatically work with them and no joystick option is displayed on screen.

CASTING THE SPELL

It seems that a game nowadays has to offer something very special to make it. Even a good idea can get lost amongst a set of screens we've seen before or in an underdeveloped scenario.

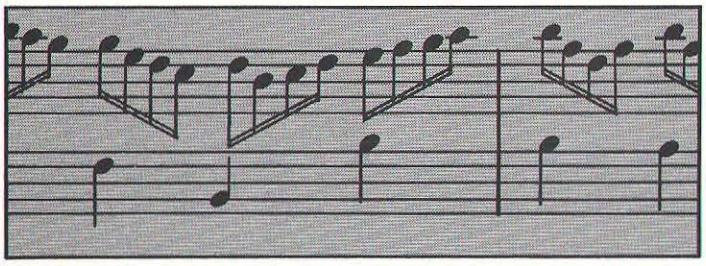
Alligata's Nightworld suffers from looking conventional. The graphics are messy and confused. Ultimate's Knight Lore succeeds with fresh visuals, clear and sharp graphics. It also has a coherent, if not quite believable, and well presented scenario. Neither score very well on sound but that Werewulf takes my filmation oscar for arcade star of '85.

The Ultimate Werewulf!



Edsoft

This months reviewers include Alison Dann Ray Allen, Des Thomas and Godfrey Hall



Title Resource Management — Linear Programming
Publisher HaMa Software
Machine Model B
Price £39.50 plus VAT

The Resource Management — Linear Programming package from HaMa is another in their series of computer assisted learning units. This unit comprises a software package and accompanying book covering linear programming by Graphical and Simplex methods.

Linear programming is not, as you may have imagined, a new method of computer programming but a well established management decision making technique.

Today's manager is frequently faced with decisions which involve allocating resources such as labour, materials and costs in a way which will either maximise profits or minimise costs. These decisions usually arise because there are insufficient resources available to allow the manager to do everything he'd like and may be further complicated by the requirement to complete a minimum amount of a particular activity. Linear programming is an ideal aid to decision making of this type, although it is only really suited to those problems where the relationships between the key variables are of a linear nature (eg where producing twice as much of a product uses twice the materials and incurs twice the cost).

The basis of the Graphical method of linear programming is that by forming linear equations of the relationships between the key variables in a problem and their inherent constraints and then plotting these on a graph, an optimum solution satisfying the maximising/minimising objectives can be identified. In situations where more than two key variables have to be taken into consideration, simple graphical linear programming is not sufficient. To solve these more complicated problems the Simplex method is used. This method employs a matrix technique rather than graphical plotting.

The HaMa package contains an excellent book covering the theory and mechanics of linear programming together with programs for both the graphical and simplex methods. There are tutorials for each method using demonstration data and there are problems to test your learning, although unfortunately no answers are supplied (!) In case all this isn't enough, the authors have helpfully supplied a bibliography of recommended further reading.

The programs are well presented, easy to use and make good use of colour and graphics. In addition to helping you learn the techniques they can also be used to solve your own problems, and although limited in the number of different constraints you can apply the programs could be useful in a real business environment.

I found this package very informative, it should be successful as a training aid for this fairly complex topic. **AD**

Ratings Table:

SOUND	N/A
GRAPHICS	80%
DOCUMENTATION	90%
VALUE FOR MONEY	85%
OVERALL	85%

Title Pentoms Puzzle
Publisher Ega Beva Software
Machine BBC
Price £9.95 disc/cassette

Pentoms Puzzle is a game of skill based on the Chinese game of Pentominoes — shapes made from five squares. The aim is to fill each grid with the pentom shapes, using each piece only once. In addition to an introductory program which gives the instructions, the cassette or disc contains two versions of the program: *Kidtoms*, which is a Pentoms Primer for use with youngsters (perhaps the inexperienced user might be more appropriate!) and the full *Pentoms* program.

Both programs use the same commands — numeric keys and — ß will select an outline pent from the shapes displayed at the top of the screen. Either the cursor keys or U,D,L,R will move a pent. COPY or T will twist the pent round until you can fix it with the RETURN key, when the shape is coloured in. If you need the other side of the pent, you can flip it over with TAB of F, while pressing the Spacebar will drop any pent you don't wnat to use. DELETE takes you into the DELETE MODE — the number of the piece you wish to remove is pressed, followed by RETURN.

Kidtoms gives 10 levels of difficulty, eg LEVEL 0 — 3 x 5 grid (3 pieces); LEVEL 5 — 5 x 7 grid (7 pieces); LEVEL 9 — 5 x 10 grid (10 pieces) so this version of the game can be used by a wide age/ability range. Complete a game and you are offered the option of another game at the same or next level. How about a class or family*Kidtoms* championship?

In Pentoms you have a choice of four grids each giving a total of 60 squares — 10 x 6, 12 x 5, 15 x 4, and 20 x 3. Apparently, the first grid has 2,339 different solutions, so obviously the game takes a lot of time and thought (whether the school computer can be tied up for this is probably questionable). If the game were played on a board with cut-out pents, you could come back to it over a period of time; unfortunately, this version hasn't got a 'save' facility, but I suppose it's quite easy to make a note and re-enter the placements made at a previous sitting.

The program will challenge the most demanding games player. The excellent facilities offered and ease of operation together with the typical quality graphics from Ega Beva make this a very useful addition to any family's collection of games. It has a serious mathematical content, and the range of options available makes it suitable for use in all schools — infants through to secondary.

I found one little bug and one niggle. Pressing the ESCAPE key at the end of the Instruction program is supposed to load the Index but my copy set my disc drive whirring to no avail. The menu page states: "Whenever you want to choose another program, press the BREAK key". I expected this to take me back to the menu page, instead of which I was taken right out of the program. This meant going through the Ega Beva logo and the address page, which seems to take an eternity! **DT**

Ratings Table

GRAPHICS	90%
SOUND	60%
DOCUMENTATION	90%
EDUCATIONAL	75%
VALUE FOR MONEY	80%
OVERALL	80%

Title Biology
Publisher Chestnut Software
Machine BBC B
Price £5.50 cassette
£7.50 disc

This Biology program was by far the best of the three Chestnut Software programs reviewed. It presents a new way of demonstrating a number of tests making use of graphics and text.

The program has been thought out quite well. To begin with you are presented with a series of options concerning the testing of starch, glucose, protein, and fats. One slightly annoying feature of the first part of the program is that if you chose certain options, you have to turn the tape over and load another program. Obviously, it would be much better if all the programs were to load at the start.

Once the option is selected you are given information about the experiment together with diagrams and listings of apparatus and then asked questions as to starch content and so on. At the end of this section you are given a

CONTINUED OVER

percentage score.

I can see this program fitting in to a science project and being used in conjuction with a practical session and I like the explanation before the questions and the idea of showing some of the apparatus to be used.

A major weakness of a lot of educational programs is that they are in effect little more than electronic textbooks and it is necessary that software designers use the vast potential offered by computer graphics and technology. In my view, the Chestnut programs have done little more than scratch the surface where education thinking and technology are concerned. **GH**

Ratings Table

GRAPHICS	70%
DOCUMENTATION	60%
VALUE FOR MONEY	70%
OVERALL	70%

Title **Maths Signs**
Publisher **Chestnut Software**
Machine **BBC B**
Price **£5.50 cassette**
£7.50 disc

This is a program designed to test the mathematical skills of young children. It loads quite quickly and the instructions given can be repeated if necessary. I was not over impressed with the instructions or the colours used, and would have been happier if there had been less text on the screen especially if this is aimed at younger children.

The child then has to choose a skill level from 1 to 5 with Level 5 being numbers 1 to 12. This part of the program was well thought out and I liked the choice element.The main section is in question and answer form where the child has to decide which sign to put in to complete the sum. This is done by pressing certain function keys which have been programmed for add, subtract, multiply, and divide but I found the arrangement of the keys awkward and it is easy to make mistakes.

If the child gets the answer right, 'Correct' flashes on the screen and a happy face appears below; if the answer is incorrect, 'Wrong' flashes up with a sad face. The faces are a good idea but poorly presented.

Overall the design of the program was quite good, but I have my reservations concerning the content and thought behind the actual material. There are a lot of programs on the market concerned with maths at this level that offer a great deal more. The Chestnut program is very much a chalk and talk exercise and I felt it could have been achieved just as easily on a piece of paper. **GH**

Ratings Table

GRAPHICS	60%
DOCUMENTATION	65%
VALUE FOR MONEY	50%
OVERALL	60%

Title **Rhythm & Pitch**
Publisher **Chalksoft**
Machine **BBC B**
Price **£9.25 cassette**
£12.25 disc

Many claims have been made through the years about the success or failure of strategies that expect transfer of training to take place. Chalksoft proudly boast in the accompanying materials to these programs that "Rhythm & Pitch helps you improve your musical skills." Rather less ostentatiously on the back page, the author, Derek Ridell, claims the possibility of developing the musical "ear". These are different things and we would be wise to remember that! More realistically, we can look at these programs as a adjunct to the music teacher's time as it does present simply and boldly the type of exercises required by examining bodies up to CSE and 'O' level.

Surprisingly, the menu lists pitch tests before rhythm tests, but the accompanying notes (if you haven't lost them!) do suggest that the user begins with the rhythm exercises. In all categories ten questions are presented and different marking systems are used to score your results. The disc version is infinitely preferable in that allows the teacher to keep a record of the success (or failure) of the users. Here I must report that on the machines I used with a double disc drive attached the results sequence activated Drive 1, but even after transferring my disc I was still unable to retain my results as the program gave a systems error message. The strange fault only occured with the pitch exercise so I am able to report that I wasn't very good on the rhythm exercises either.

Given that we accept the value of such exercise then these programs are well presented. The user has a choice of five colours to suit his situation (his decor perhaps!). The range of only three sound levels could have been wider and perhaps also a choice of tonal quality for the sounded examples.

As in other music software that I have reviewed some of the higher level rhythm exercises were made extra difficult by the computer's refusal to sustain resonance when choosing the slowest of the three available speeds. This also lead to the aural impression that rests needed to be added, as well as in some of the pitch examples producing some quite odd phrasing.

I think there can be little doubt that these programs will prove to be valuable tools in the harassed music teacher's armoury. Whether they give any indication of a child's musical aptitude is more questionable — but so are most of the wretched music syllabi that our luckless students have to study! Given the limitations of the exercise, and that after all is not in Chalksoft's control, I give a warm welcome to these materials. **RA**

Ratings Table

GRAPHICS	80%
DOCUMENTATION	45%
SOUND	70%
VALUE FOR MONEY	80%
OVERALL	75%

Title Reading Music Grade 1
Publisher Ardsoft
Machine BBC B
Price £40

Many years ago I was one of the many fortunate (?) children sent on the road to passing music grade exams. Memories of sitting for hours with dry music theory workbooks trying to work out the tonic triad of G Major came flooding back as I sat down with these programs. Would I receive again those disdainful looks as I put in the incorrect rest or managed to get wrong, yet again the key signature of G— minor?

These were fears that I am sure I was not alone in encountering but now comes Ardsoft with an answer, or so they say in the rather meagre accompanying notes. Many claims are made about the motivational factors coming from the use of the computer's sound facilities and these for once can be largely substantiated. In fact, Ardsoft has produced a most impressive package that can be used with children and adult learners alike from, it is suggested, the age of nine upwards.

The course presupposes no existing knowledge of musical theory and takes the beginner at a moderate (if sometimes, for my taste, a little too slow) pace through the basic elements of reading and understanding musical notation. Rhythm and pitch are introduced separately and reinforcement exercises such as clapping rhythms and counting note values are required. Each program is divided into Chapters and Sections according to the areas of the subject being attempted. The programs can be entered at the various sub-stages listed in the individual menus provided.

At strategic points in the course, "Information Tester" programs are introduced which give the pupil direct feedback on how well he/she is doing. The last two programs are music examination papers similar to the kind used by institutions such as the Associated Board of Music.

Comprehensiveness is the keyword of this course. Indeed, all Grade 1 theory is covered in detail and much of Grade 2 also. Structure and progression have been very well thought out and all the practical exercises lead on well from one another. The six parts of the teaching course are subdivided into sections dealing separately with rhythm and pitch and in part six, expression marks in both English and Italian are introduced.

When errors are made the pupil is either given on screen clues or references to other sections of the programs to be revised or is sent

directly to other screens to accomplish that revision. This is all very well managed. Occasionally, however, a silly slip on the keyboard can lead to frustration as you are whisked away from your work to a revision screen. Perhaps an "Are you sure?" query could have been used to trap errors arising from keyboard "slips".

In any scheme of such a comprehensive nature there are bound to be some niggling points and this package was no exception. The following are examples of a few such niggles:

In Program 2 the dot marking sounding notes did not "reshow" for second semi-breve.

The statement:"This (bar line) is to show the main accents of the music" is, I have found, a misleading statement and often causes children to place unnecessary attention to the first beat in the bar. Many recorder tutors, for instance, use folk material for their examples, and this could be very damaging to children's interpretation. One thing contemporary music has shown us is that the domination of the barline is now past – so we must be careful!

When counting note value in the exercise, why has more care not been taken over last notes in musical phrases – none of the semi-breves count their full value?

The term "tetrachord" is introduced in Program 4 without any explanation. In Program 6, the diagram showing why F– is needed in the scale of G Major links B and D instead of B and C.

Program 7: although clapping examples in 3/8 time for instance, are naturally fast, some allowance needs to be made for learners who would find the speeds excessive.

Program 11: when entering the scales the bass line should line up with the treble and this causes visual confusion. When sounding the notes of the tonic triad, the indicating dot should appear along side the sounding note rather than underneath. Perhaps the note could have been made to flash whilst sounding?

Programs 14-18: explanations of using accents with slurs needs a "sounding" example.

These are all small points put alongside the overall excellence of the programs. Perhaps a more positive response to correct answers could have been given and a more colourful screen display would have been welcome, but a great deal of care and expertise has obviously gone into this enterprise and it is all too easy to nit-pick. If you are going in for musical grade exams then this program would be tremendously helpful. Equally, if you just want to learn musical notation then I can think of no less painful or thorough way of doing it. Congratulations Ardsoft – let's have some more – but somewhere, how about reminding pupils that musical inspiration lies outside musical theory not alongside it! **RA**

Ratings table

SOUND	60%
GRAPHICS	85%
DOCUMENTATION	55%
EDUCATIONAL	85%
VALUE FOR MONEY	75%
OVERALL	80%

Title **Kings and Queens**
Publisher **Chestnut Software**
Machine **BBC B**
Price **£5.50 cassette**

Kings and Queens provides the user with a list of names and dates of the monarchs of England. An option menu displayed at the beginning includes revision of Monarchs, a print out and a test on the dates and names.

If the first option is chosen, a list of monarchs together with dates appears on screen. Pressing C enables the user to see more and although pleasantly displayed, this could have been done just as easily in a book. Also without going back to the option it was impossble to look back at the other screens.

When I attempted to use the print out option my daisy wheel and dot matrix printer only succeeded in producing part of the list and I would advise that you check with the manufacturers that you wil be able use your printer with this program. Perhaps Chestnut Software could list the printers that are compatible with the software in the documentation.

The tests in the final options merely provide questions on the name of a certain monarch or the dates of their reign.

I felt that the whole program was rather dull and unexciting compared to other similar programs and it soon becomes boring. There were several references in the documentation as to the way in which answers should be entered and there did appear to be a number of snags that still needed to be ironed out in the programming. **GH**

Ratings Table

GRAPHICS	60%
DOCUMENTATION	55%
VALUE FOR MONEY	50%
OVERALL	60%

Titles **Griddle/Matchplay**
Publisher **Clockwork Computing**
Machine **BBC, Electron**
Price **£6.90 (cassette)**
£9.20 (disc)
£15.50 (disc – both programs)

Griddle and *Matchplay* are early learning programs for use with pre-reading children of three years and over.

Griddle offers a wide range of playing options, which can be selected from menus, giving the teacher or parent excellent control over the level of difficulty of the game. The program design confining the control to SPACEBAR and RETURN is very useful for young children.

The idea of the game is very simple – there is a hidden picture which can be revealed bit by bit by correctly matching shapes or numbers. The screen shows a grid containing 4, 8, 16, or 36 boxes, which cover the picture, and a "Test" box. The shapes option allows the user to select from 2 to 9 shapes on the grid. Depending on the chosen game, the grid fills with shapes, blocks or numerals, one of which will then appear in the test box. The child has to find a box in the grid whose contents match the test box.

If a correct match is made, the part of the picture under the chosen box is revealed. This adds another dimension to a useful but fairly ordinary matching program as it allows the children to predict what they think the picture might be, so helps to stimulate language development.

Matchplay contains three programs,*Match, Garden* and *River*, designed to help develop memory, observation and logic – skills important in many early learning activities. The first,*Match*, is really a shape recognition/matching game to prepare for the other two and introduces six animals and two human shapes which appear in the second game,*Garden*. The eight shapes are shown on a grid at the top of the screen and each shape is repeated in a line at the bottom of the screen. One of the upper groups is marked with an "X" and the object is to find the shape in the bottom line which matches the marked shapes. The position of the shapes is random, so no two games are the same.

Garden and *River* provide a sort of Kim's game. In the first, the child is shown the position of characters in the scene which then disappear and the child has to replace these in the correct locations. *River* does not show the positions first so the child must use logic to decide – will it be the duck that fits on the pond or the sheep? I liked the idea, but found it somewhat spoiled by some rather crude graphics – some of the figures were very small! A useful option enables the games to be run consecutively.

The programs are very user friendly – the programming of the BREAK key to return the user to the menu and the very useful sound level control option – and the instruction booklets were clear, concise and devoid of pretence. Neither program does anything that cannot be done with pen and card, but for all that are useful for the preschool and nursery age child.

While it is unlikely that many homes will have a Concept Keyboard, schools that have would find an option to run the programs with one a useful addition so that screen pictures could be matched with those on the overlay. **DT**

Ratings Table

SOUND	60%
GRAPHICS	65%
DOCUMENTATION	80%
EDUCATIONAL	65%
VALUE FOR MONEY	60%
OVERALL	65%

Quinkey Education

Getting Keyed into the Future

Sarah Wells

If you could buy just one peripheral for your BBC, which would it be? For my money, about £130 for a comprehensive package, the Quinkey could be a contender. It really is beginning to look as though it could solve two of the main problems with computing in schools: We all know that we have been landed with the QWERTY keyboard for historic rather then practical reasons and applications including word processing must involve more than the individual at the keyboard from both practical and philosophical points of view.

Realising the advantages of being able to produce really neat, error-free work without the skills of a calligrapher or a touch-typist, Cy Endfield, perhaps previously best known for his direction of the film "Zulu", had the vision to invent the Microwriter. A small electronic box with its own screen, it allowed the user to write one-handed by means of touching only five main keys and a sixth "shift" key. Letters are selected on the release of different combinations of the keys. Marketing of the original Microwriter began in June 1982.

The Microwriter company have gone one, or rather four better now with the Quinkey. Dedicated software enables up to four children to write at one computer simultaneously. The four Quinkey keyboards link to an interface unit, a simple matchbox affair with four sockets, which in turn plugs into the ANALOGUE IN port in the back of the BBC. Using the QUAD software, the individual screens of the original Microwriter are replaced by simultaneous shared use of the monitor screen. Each "window" prints text in a different colour making it easy to pick out.

Teachers lucky enough to be given the opportunity to trial the equipment report that the claims that the alphabet and main puntuation can be mastered in under one hour are substantiated. Children seem to reach their normal handwriting speed within a total of five hours' use. Microwriter supply software in the form of a "zapping" space-invader type game SCRAM to facilitate this process if the teacher wants to use it. The main aids to the acquisition of this form of touch-typing skill though, are the good documentation, including prompt cards, and the fact that all the key combinations relate (often rather cornily) to the shapes of the words and numbers they elicit. The maximum possible speed averages around 40 w.p.m. The box can be held comfortably by hands as small as those of a six year-old, and the whole ergomomics business is made altogether healthier in that the user's position is far less restricted than with the conventional keyboard.

Children involved can sit further away from the screen or as close as before, as they wish (and one imagines that infra-red links will eventually replace the cabling). Their eyes are free to watch the screen and concentrate on the content of the work in hand. We all know that even fluent and imaginative writers are often handicapped by the mechanics of handwriting but that could realistically become a thing of the past.

QUAD allows up to 75 lines of text to be typed into each window. Five lines only are seen at any one time and the rest rolls off into memory. I wondered if this caused problems but Yvette Blake, one of the teachers involved in trials, assured me that this was not the case, perhaps because the material being entered is so personal to the writer. The written text can be recalled, corrected and edited, again with each section being independently operated. The final draft can then be printed out or saved onto disc or cassette.

PROG enables many programs normally operated from the BBC keyboard to be controlled entirely by the Quinkey and so extends their use to a whole range of activities. Applications afoot include an interactive version of Acornsoft's adventure game entitled Spooky Manor. Microwriter point out the other main applications as being in the area of text handling. It could certainly be interestingly used with TRAY (described by Christopher Schenk as "the ultimate in cloze procedure".) Co-operative writing is likely to be facilitated by multiple keyboards which might make for some interesting plays and it also has possibilities for the building and interrogation of databases. The only activity that the Quinkey does not seem well-adapted to is BASIC programming and other activities requiring constant use of the numeric shift.

Applications are constantly under review and being modified. QUAD2 is a on its way and this will reputedly provide better text insertion facilities. It will enable users to save individual texts (not possible with the original QUAD) and recall text to any Quinkey which will make for a much more flexible arrangements in the classroom. They are also looking into the possibility of sharing the screen among the Quinkeys actually in use i.e. when only three are on they will get a third of the screen each. At present the line length is restricted to 37 characters and there are plans to provide more variety of format. Other ways to make the system more flexible are on the drawing board including the possibility of being able to spool text directly into word processing packages such as Wordwise.

At the moment the utility program WP serves to link the Quinkey to both Wordwise and View and facilitates faster input by providing easier access to the additional shifts required by these packages. As with all word processing a printer is really essential to make the whole thing worthwhile and motivating.

The system was put on trial in Newcastle schools during 1983 and a major study was launched there towards the end of last year. It will involve 14 schools and more than 30 teachers, 100 pupils and 23 micros at a cost of £20,000. Its purpose is to further investigate earlier provisional claims that pupils tend to write more with this facility, that concentration improves and this transfers to other classroom activities, that children take a more critical attitude to what they write and that punctuation, spelling and even the children's own handwriting improves.

Early work has seemed to indicate that more back-tracking and re-reading occurs possibly because the product of the composition process is more readable. Simply working side by side in such close proximity is likely to increase children's awareness of each other's work and in an appropriately cultivated climate this is bound to lead to more mutual help and criticism. Plenty more research is needed of course, but it obvious that the equipment will be extremely useful to those in special education, it has already started to be.

As with all technology we have the choice of employing it to perpetuate the old drills and skills philosophy or utilising its potential to help teachers, and the pupils themselves, to realise that when mechanical problems of handwriting are eliminated, words can flow

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Ikon

Margaret Stanger

Ikon art for mice, joysticks and fingers.

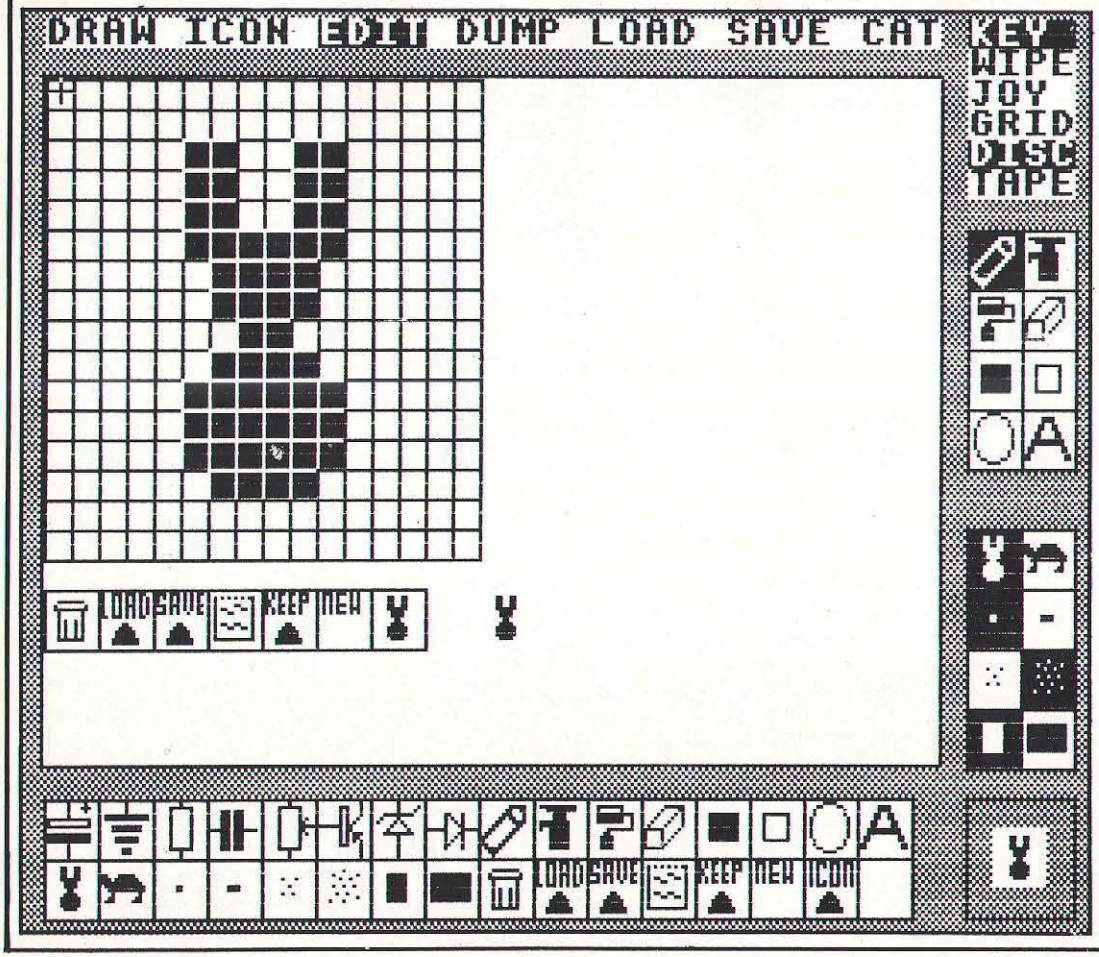
I recently had the opportunity of using the superb AMX Mouse with its associated software to produce a number of diagrams. I was very impressed with the program, particularly its ease of use. I was less impressed by the current price of the package. The experience made me wonder just how difficult it would be to write such a program from scratch. The program, Ikon, is the result of several weeks of hard work. Whilst comparisons between Mouse and Ikon are perhaps inevitable, it should be said at once that this program is nowhere near as versatile or sophisticated as the commercial one. On the other hand it is much cheaper!

At the start, a list of desireable features was drawn up. It was quite a list, but as the program progressed some features had to be simplified and others omitted altogether. Two major restrictions were self-imposed from the outset. Firstly, since the program was likely to end up as a magazine article, long machine code routines were to be avoided to make typing-in the program somewhat less tedious and error prone. Secondly, the program had to be suitable for tape-users as well as disc-users so overlay techniques were not very practical.

The final program contains the following features:

Lines can be drawn in two thicknesses using a 'rubber banding' technique. Rectangles and circles can be drawn by fixing either one corner of the rectangle or the centre and radius in the case of the circle.
Different shadings can be applied either by a quick fill routine or by a roller in one of two widths.
A variable density airbrush effect is available, also an eraser facility and provision for entering text.
User-defined Icons can be placed anywhere in the drawing area and these Icons can be defined or redefined without leaving the program.
There is a facility to load or save either sets of Icons or the drawing area, together with the chance to catalogue the disc or tape. For hard-copy the program contains a print dump routine to print out the entire drawing area on an EPSON compatible dot-matrix printer. The ability to print out data for the Icons is also provided.

The program is quite straight forward and should present no problems in typing and debugging.



Press ‹BREAK›
Type in and SAVE "IKON"
Set PAGE=&1C00 and type NEW
Type in and SAVE "IKON1"
Type in and SAVE "IKON2"
To RUN the program:-
Press ‹BREAK› to set PAGE to its default value
CHAIN "IKON"

After loading the program, the screen will display the drawing area, the options in the form of iconS or text, and the cursor in tne centre of the screen.

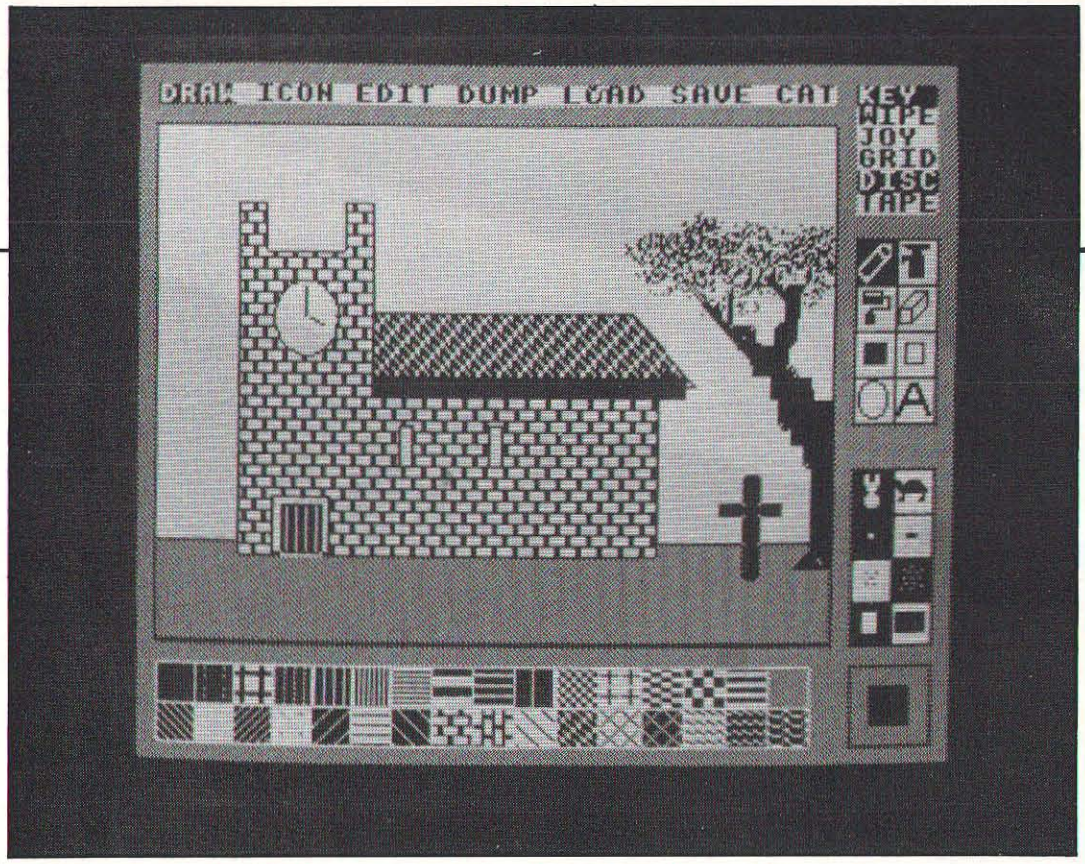
The cursor movement has several options. It is moved normally by the cursor keys at a speed determined by the chosen cursor speed. This speed is chosen by selecting the'hare' icon for fast or the 'tortoise' icon for slow. Whichever speed is chosen using SHIFT in conjunction with the cursor keys will move the cursor rapidly. In addition CTRL and the appropriate cursor key will move the cursor to the menu areas at the edge of the screen.

To choose the various options, the cursor is placed over the name or the icon, and COPY is pressed. The choice is confirmed with a beep, and the appropriate icon colours will invert.

THE OPTION

There are seven main options available. Their names start at the top left hand corner of the screen.

DRAW This is the default option and allows the user all the drawing options.
ICON All the drawing options are available except for FILL and ROLLER. In place of these two options the user can place on the screen an icon chosen from the menu under the drawing area.
EDIT When this style is chosen the user can define new iconS or edit existing ones.
DUMP This option will produce a



positive dump of the drawing area on any Epson compatible dot matrix printer.Pressing ESCAPE will exit this routine and return to the program.

LOAD This style permits loading of previously saved files, either icons or SCREEN. Errors such as 'File not Found' will be reported, and the program can be continued by pressing RETURN. Generally because of the different load addresses the program will automatically know which it is dealing with, but care should be taken not to LOAD any other type of file which may overwrite the program and cause it to crash.

SAVE If selected during the EDIT mode, the set of icons will be saved to tape or disc, otherwise the drawing area will be saved. If an error associated with saving a file occurs,(like 'Disc Full'), the error will be reported and the user can continue the program by pressing RETURN.

CAT This allows a tape or disc to be catalogued without leaving the program. The information will appear in the area normally occupied by the icons or patterns and is 'paged' ie SHIFT may be needed to scroll through the information (particularly when using disc). Pressing ESCAPE will exit the catalogue routine and return to the program restoring the currently chosen icons or patterns.

THE CHOICE

There are six 'choices' available, listed at the top right hand corner of the screen.

KEY This is one of the default choices and it allows the cursor keys to be used for movement.

WIPE This choice will clear the drawing area to its normal white colour.All information on this area will be lost and for this reason an 'Are you sure' prompt is issued.

JOY Allows joystick control of the cursor. Note however that control is not analogue, the joystick merely serves as four on/off switches.

GRID This prints a dot 'grid' on the screen to assist drawing. Reselection of this choice will remove it. The grid is automatically removed before saving or loading the screen.

DISC This is the other default choice and selects DISC as the current filing system.

TAPE This choice selects TAPE as the current filing system.

THE BRUSH

When the program is in drawing style, the following drawing instruments or 'brushes' can be chosen from the set of icons directly under the choices on the right hand side.

PENCIL This is the default selection. Move the pencil to the beginning of the required line and press SPACE. Using the cursor keys, place the end of the line where required and press RETURN to fix it. Before the line is fixed, it can be cancelled by pressing DELETE.

AIRBRUSH After the airbrush is selected, press SPACE to start the airbrush and RETURN to finish in the drawing area. DELETE will finish the action without clearing the area. In use, movement of the cursor spreads a random pattern of dots and different densities can be built up by going over the pattern.

ROLLER The roller allows large areas to be filled with any chosen pattern. To start the roller press SPACE. A square cursor will be produced, showing the area covered. Moving the cursor will leave a trail of the pattern, until RETURN is pressed. DELETE will terminate the effect without clearing it. The roller with the white pattern can be used as a large eraser for large mistakes.

ERASER The eraser has two different functions. Either it can be used in the normal way to erase parts of the drawing or it can be made to draw, in black, under cursor control. This option is very useful for free-hand drawing or filling very small areas. In 'eraser' mode you have the option of two widths and a very small cursor. It is particularly useful for erasing in a confined space. If using the higher speed only alternate pixels are erased, so use the slower (tortoise) speed for complete accuracy in erasing.

When the eraser is chosen, the option for the roller width is automatically set at narrow. If this is set to wide *after* selecting the eraser then the free-hand drawing mode is invoked. (The automatic setting of this width is included to prevent accidental drawing when erasing was intended).

FILL When SPACE is pressed, any area bounded by a black line (including the whole screen if required) will be filled with the currently selected pattern. The fill routine is much faster than the BASIC fill routines but in order to increase the speed the ability to fill very small areas has been sacrificed. It should be noted that the area is filled on a vertical scan and thus when filling an irregularly shaped area it is generally better to place the cursor in an area of maximum height or small areas may be left which cannot be filled. Note that the roller can be use to paint over these areas, and the eraser can tidy up the edges if necessary.

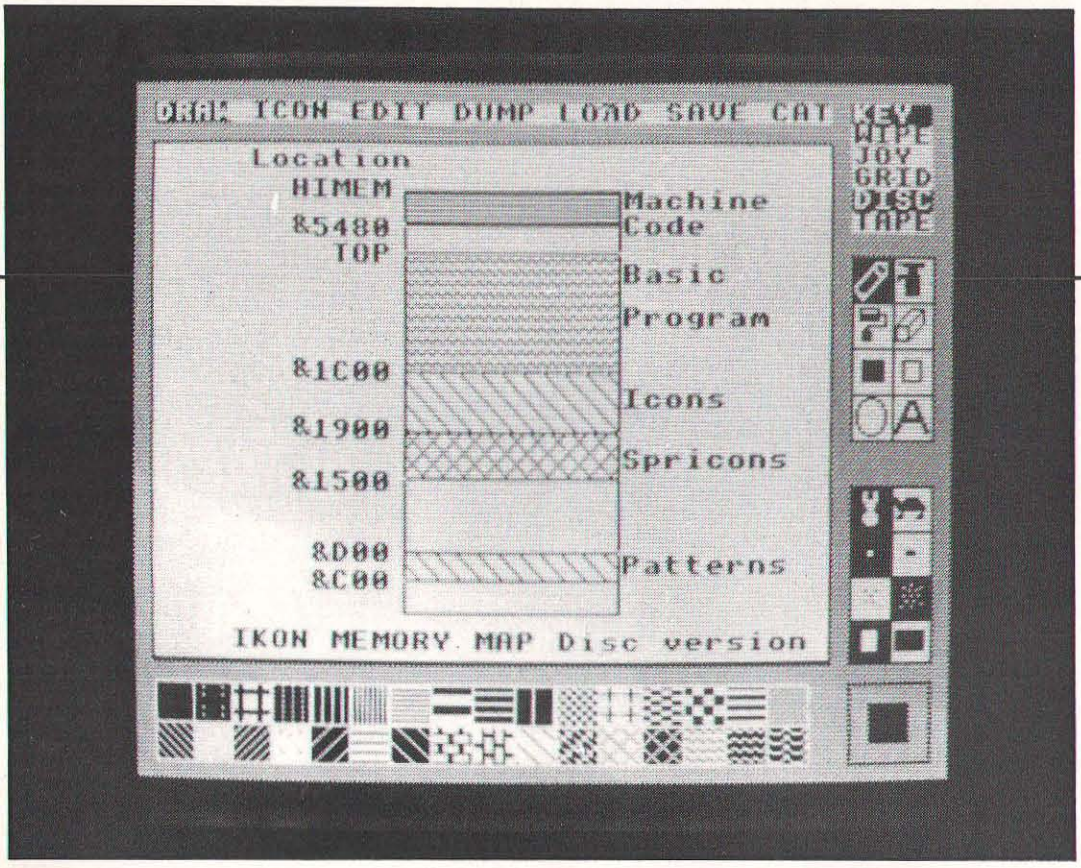
Due to the way the fill routine is implemented it is not possible to fill over a filled area, though in some cases a different pattern can be formed by trying to fill a filled area.

RECTANGLE The first of the predefined shapes. The cursor marks the bottom left hand corner of the rectangle. Having set the cursor to the required position press SPACE and use the cursor keys to 'rubber band' the rectangle to the required size and shape. Pressing DELETE will cancel it or pressing RETURN will fix it.

CIRCLE The other predefined shape. The cursor marks the centre of the circle and pressing SPACE will fix it. Use the cursor keys to define the radius. The drawing can be cancelled by pressing DELETE or the circle drawn by pressing RETURN.

TEXT After pressing SPACE to start, the box cursor marks the begining of the text. A line of text can be typed or deleted normally in this routine which finishes when RETURN is pressed.

CONTINUED OVER



SPEEDS AND SIZES

The next set of icons can alter the speed or size of the chosen brush.
HARE This is the faster speed, the cursor moves two pixels at a time when using the pencil, eraser and airbrush and when drawing circles and rectangles. Some sensitivity is sacrificed here.
TORTOISE The slow and steady speed of one pixel at a time, recommended for accurate drawing and erasing.
THICKNESS1 Gives a line thickness of one pixel for pencil, eraser, circle and rectangle.
THICKNESS2 Line thickness of two pixels for the pencil, eraser, circle and rectangle.
SPRAY1 Gives the airbrush a lower density spray.
SPRAY2 Gives the airbrush a higher density spray.
WIDTH1 Gives a roller and airbrush width of one character.
WIDTH2 Gives a roller and airbrush width of two characters. This option can modify the eraser to black.

THE PATTERNS

The lower block contains the patterns, the currently selected pattern appears in the right hand block. The pattern can be altered by placing the cursor over the chosen pattern and pressing COPY. This pattern will be used for all fill and roller routines until changed.

THE ICON OPTION

When icon is chosen, the lower block will change to show the currently defined icons. Also two 'icon' icons (if you see what I mean) will replace the fill and roller in the right hand block. These two are interchangeable and the roller and fill are no longer available. As it is possible to go from the DRAW option to the icon option (and back) without losing the contents of the drawing area this should not be a problem.

The icons themslves can be chosen from the range in the lower block in the same way as the patterns. After selecting icon from the drawing instruments, the current icon can be roughly placed by moving the cursor and pressing SPACE. After that the icon can be 'shuffled' one or two pixels at a time for accurate placement and finally fixed by pressing RETURN, or cancelled by pressing DELETE.

The other drawing facilities on display are still available and sets of icons can be SAVED or LOADED without leaving the program or losing the drawing.

THE EDIT OPTION

Although the drawing options are not now available, the icons can be chosen in the usual way. The EDIT option allows you to define your own icons on a sixteen by sixteen grid in the drawing area. The 'Are you sure' prompt is given whenever the contents of the drawing area are overwritten. To start your icon move the cursor into this grid and press SPACE, the cursor will be confined to the grid until RETURN is pressed. The cursor can now be moved in the grid one square at a time. Press 'Z' to put a bit in the icon, or 'X' to delete a bit. These two keys can be operated by the left hand, while the cursor is steered by the right. The new icon is diplayed below and to the right of the grid. Below the grid are five edit options.
BIN This allows you to discard the icon you have just defined.
LOAD ICONS With this option you can LOAD a new set of icons.
SAVE ICONS The current set of icons can be SAVED using the current filing system. A filename will be requested.
PRINT DATA The data for the current icon will be printed on a printer, and will appear in the pattern area.
KEEP ICON The newly defined icon will replace the current icon.
NEW ICON The grid will be cleared, and the cursor placed ready in the top left hand corner. There is no need to press SPACE to start.
EDIT ICON This is a picture of the current icon. With this option the current icon is expanded and placed in the grid ready for editing. The cursor is placed as in the previous option. If you edit the icon and decide not to keep it, the original will not be altered.

If a complete screen is inadvertantly loaded in the EDIT mode the editing grid will be lost. The screen loaded in this way will disappear

The following information is provided to assist anyone who wishes to alter or extend the program.

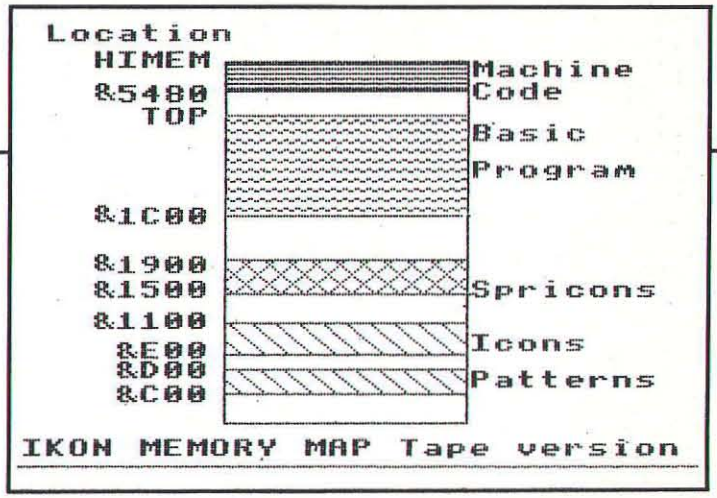
USER-DEFINED CHARACTERS

The first 32 user-defined characters are stored from &C00 to &CFF. The location of the next set of user-defined characters depends on which filing system is being used. If the cassette filing system is used, page will default to &E00 and the next character set will be stored from &E00 to &10FF. If the disc filing system is being used, page will default to &1900 and in this case the character set will be stored from &1900 to &1BFF. Program changes will be necessary if other filing systems are fitted. The relevant memory maps are shown below.

The character storage area is selected by the program which determines the current filing system by allocating the default value of PAGE to Z% in the first program. Being a resident integer variable, Z% can be passed to the second and third programs.

SPRICONS

An icon is made up of four user-defined characters arranged two by two. A spricon is a block of data



that can printed as either an icon or a sprite.

The data for the spricons is stored from &1500 to &18FF. The chosen spricon can be copied into the spare icon area and printed as an icon when it has to be placed accurately or POKED to the screen very quickly as a sprite.

FILES

The drawings or icons to be saved can be given a filename up to seven letters long. This filename is input using OSWORD 0 in PROC-FILENAME and stored from &1480. During the LOADing procedure the command line consisting of "*LOAD "+FILENAME starts at &147A. X% and Y% are set to the low and high bytes of this address and the O.S. routine OSCLI at &FFF7 is called. Basic 2 users could implement this directly using the keyword 'OSCLI'.

PRINT DUMP

A dump routine is included in the program. The routine can be replaced by the users own routine if required. If you a ROM based dump routine in your machine this could be called from PROC-DUMP.

FURTHER SUGGESTIONS

The patterns could be altered but remember that the program uses 128 for blanking and 139 as the cursor. The original program used '+' as the cursor but the double thickness lines were not precise enough and joining lines exactly was very difficult.

The built-in BASIC fill routines could be used if preferred. They give great precision when filling but are very slow. The fill routines in the program are quite fast. This is partly because they are written in machine code but also due to the fact that 'filling point' moves in PRINTTAB steps. The penalty for the speed is that occasionally in complex shapes very small areas may be left unfilled.

The program does not occupy all the available memory nor is it written in a particularly compact way. The user should have sufficient space to add to the facilities, particularly if the program is typed in in multi statement lines or packed using one of the many utilities available.

IKON- THE HEADER

This short header program changes PAGE and CHAINs the next program, IKON1. White teletext graphics have been used in a random pattern for the title page but any other display could be used in MODE7, MODE6 or even MODE4 or MODE5.

VARIABLES
I% Loop variable
X% Loop variable
Z% Default value of PAGE

MAIN PROGRAM
30 Sets MODE7 and removes cursor
40-80 Prints random pattern border with solid edges.
90 Prints title.
100 Sets Z% to the default value of PAGE for use in the next programs.
110 Sets text window.
120 Sets KEY 0 to change PAGE and CHAIN IKON1.
130 Implements the instructions in the KEY 0 buffer

IKON1 – THE DATA GENERATOR

This program defines the characters, assembles the machine code, reads in the DATA and CHAINs the next program.

VARIABLES

A% Item of icon data.
I% Loop variable.
P% Program pointer for start of machine code.
Z% Default value of PAGE.
PASS Assembly loop variable.

MAIN PROGRAM

20 Defines characters.
30 Assembles machine code.
40 Puts spricon data into memory.
50 CHAINs IKON2.

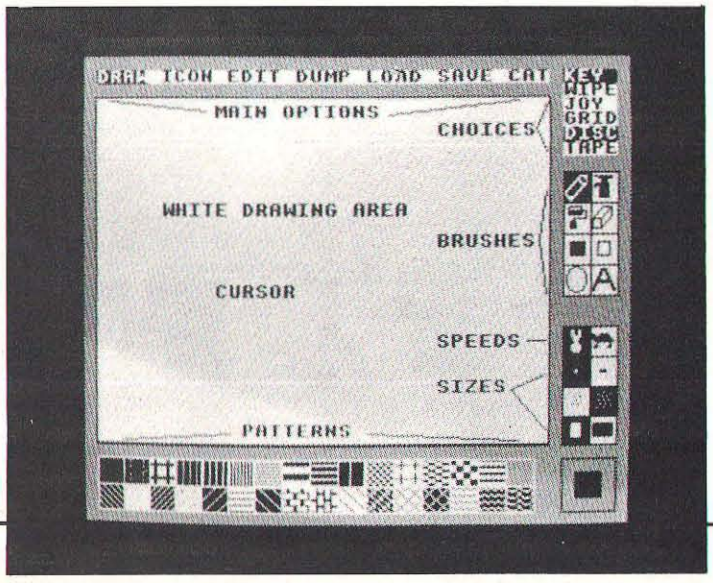
PROCEDURES

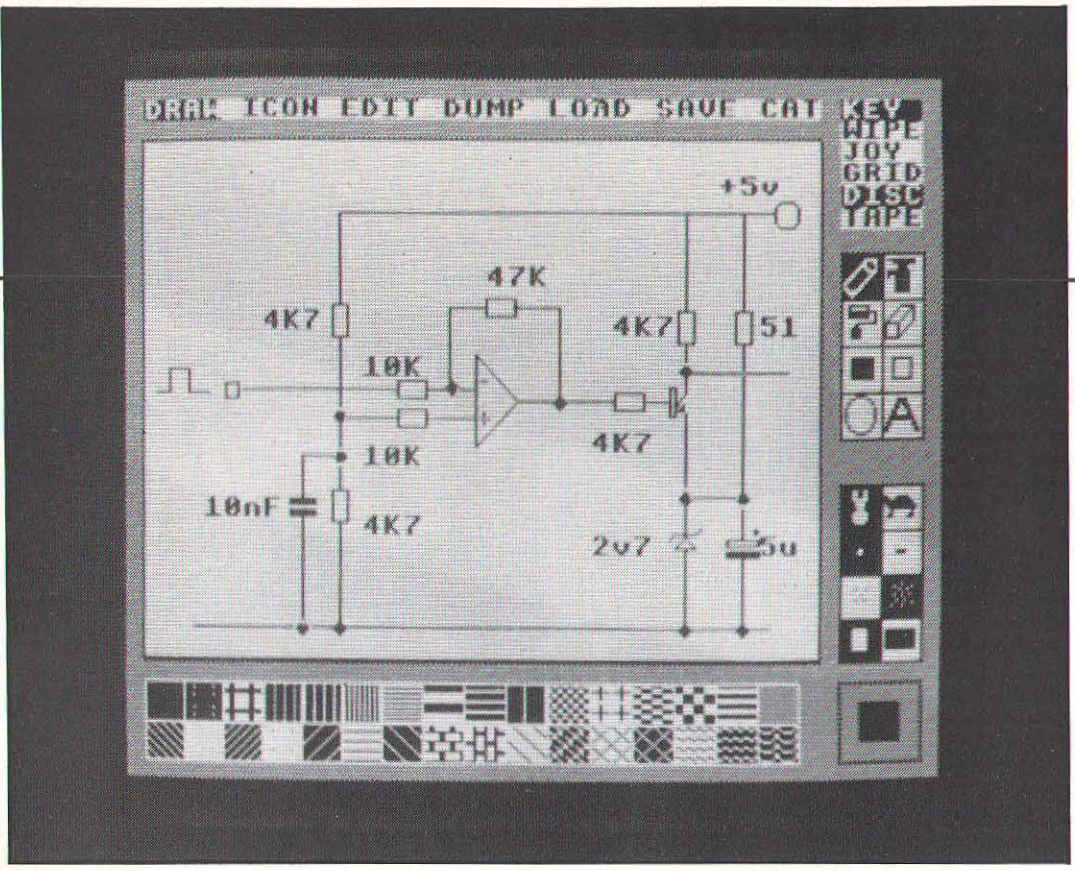
PROCDEF
The user defined characters 120-159 PATTERNS
Character 128 is used for blanking, 139 is the cursor, but any of the others could be altered.
160-191 BRUSH ICONS
160 pencil
164 airbrush
168 roller
172 eraser
176 fill symbol
180 rectangle
184 circle
188 capital A
192-223 SPEEDS and SIZES
192 hare
196 tortoise
200,204 thicknesses
208,212 spray sizes
216,220 roller widths
224-247 EDIT OPTION ICONS
224 Bin
228 LOAD Icons
232 SAVE Icons
236 Print
240 KEEP Icon
244 NEW Icon
also-
248-251 ICON Icon
252-255 Vital spare Icon space. This is used by the program and should not be used.

PROCAS
There are four machine code routines:
PIC Pokes the SPRICON to the screen.
FILLUP Fills an enclosed area above the cursor with the chosen pattern.
FILLDOWN Is a similar routine for the rest of the enclosed space.
XLOOP Prints one line of the drawing area on the printer during screen dump.

NOTE As the drawing area is white with black markings, all these rou-

CONTINUED OVER





tines had to be written in reverse; an empty pixel contains 1 and a full pixel contains zero.

PIC

1410-1450 Pokes top half of Spricon.

1460-1490 Increase base and location by 320

1500-1540 Pokes bottom half of Spricon.

FILLDOWN

1560 Checks for black in first position and exits

1570 Left and right scan for 8 vertical lines downwards.

1580 Sets flag when boundary is reached.

FILLUP

1590-1610 Similar routine, moving upwards.

SCAN

1620-1680 Saves initial location, goes to UNIT subroutine, increases the location by 8 and repeats these two processes until the right hand boundary is reached. A similar routine is carried out for the left hand side using UNITL

UNITL and UNIT

1690 Jumps to left boundary flag routine.

1700 Clears flags and sets &8B to white

1710 Puts the byte of filling into &88, and the byte of drawing area into &89

1720 Goes to left hand boundary routine if bit 1 of the screen is clear.

1730 Skips to next bit if bit 1 of filling is set.

1740 Subtracts 1 from &8B to correspond with filling.

1750-1970 The process is repeated for bits 2 to 8.

1980-2230 Repeats the process for the right hand side, from bit 8 to bit 1.

2240 No boundary, puts &8B into drawing area.

2250 Fills up to the boundary.

2260 Sets 'full' flag.

XLOOP

2270 Adds bit to character.

2280 Initalises &85 to 0, and &86 to 128

2290-2300 Adds 32 to horizontal coordinate.

2310 Sets counter to zero

2320 Uses OSWORD 9 to find the colour of the pixel at X,Y

2330 Branches if the pixel is black

2340 Next bit

2350-2360 Subtracts 4 from horizontal location

2370 Increases counter and compares for end of character.

2380 Sends character to printer.

2390-2400 Increases vertical location.

2410-2420 compares for end of drawing area.

2430 Line feed.

PROCSPR

2480 Reads data for 8 spricons

2490 Transfers the last 96 user defined characters for use as spricons. Extra data could be read in to this area if preferred.

DATA

This is the data for eight printed circuit symbols, but any other data could be used.

IKON2- THE MAIN PROGRAM

VARIABLES

A% Used in expanding an ICON in the editing routine, also as the flag in PROCSPRICON that determines how the spricon is printed

B% Used to expand the ICON in the editing routine

I% Loop variable

K% Loop variable

M% Used in PROCSQUARES

N% Used in PROCSQUARES

R% Radius of circle

X% Low byte of filename address

Y% High byte of filename address

Z% Default value of PAGE

NUMERIC

A	KEY pressed
BRUSH	Drawing option
BOX	Size of box cursor for roller
B	Variable used in drawing circle
COL	Colour of squares
C	Circle variable
DIGIT	Bit being edited
DOWN	Row of icon
DX	Change in horizontal position of cursor
DY	Change of vertical position of cursor
D	Circle variable
EDIT-OPTION	Used to determine the fate of the newly defined ICON
ENDX	Horizontal position of fixed end of line
ENDY	Vertical position of fixed end of line
F	Circle variable
ICON	The icon being printed
JOY	Joystick flag
LAST	Last option
MINX	Lower horizontal limit in PROCSQUARES and FNLIM
MINY	Lower vertical limit
MAXX	Upper horizontal limit
MAXY	Upper vertical limit
N	Circle variable
OPTION	Main option number
PATTERN	The current pattern for fill and roller
PLACE	Horizontal position of the cursor on the editing grid
R	Circle variable
SPREDIT	Current sprite being edited
SPR	Current sprite being printed
START	This is true if a drawing action has been started by pressing SPACE, but not finished by pressing RETURN
SCREEN	Screen location used as the loop variable in PROCGREY
SPEED	The basic speed of the cursor
SPRAY	The density of the airbrush
SIZE	The size of the square boxes
S	Circle variable
THICK	Thickness of pencil and eraser
T	Circle variable
WIDE	Width of roller and airbrush spray
WX	Horizontal thickness of line
WY	Vertical thickness of line
X	Horizontal position of cursor
XX	Last horizontal position
Y	Vertical position of cursor
YY	Last vertical position
YPLACE	Vertical position of

	cursor on the editing grid
Z	Used in INKEY delay

MACHINE CODE LABELS

FILL-DOWN	Start of fill, down from cursor.
FILLUP	Start of fill, up from cursor
PIC	Start of SPRITE routine
XLOOP	Start of machine code print dump.

STRING VARIABLES

A$	Used in "Are you sure" routine
CHOICE$	Choice being printed
OPTION$	Option being printed

ARRAY CHOICE-(I%) **There is a flag for each choice which is set if the choice is in operation.**

MAIN PROGRAM

20 Accesses initialisation routine
30 Sets MODE4
40 Makes the screen grey
50 Displays the right hand icons
60 Sets up the patterns
70 Clears the drawing area
80 Prints the options and choices
90 Diverts to the error routine when an error occurs
100 Prints the cursor
110-160 MAIN LOOP
Goes to PROCMOVE when in DRAW option, PROCTECHDR when in ICON option and PROCDEFICON when in EDIT option
ERROR ROUTINE
4990 Turns off printer
5000 Restores default windows
5010 Explodes font
5020 Restores normal auto repeat
5030 Diverts to 5130 if the error is not ESCAPE and is not connected with the filing system
5040 Diverts if escape is pressed during first three options. This line could be removed if desired once the program is debugged
5050 On a filing system error (eg Disc full or file not found) the error is reported, and the computer waits for RETURN to be pressed
5060 Restores default windows
5070 Separates cursor
5080 Replaces the patterns or icons
5090 Puts Last option to draw if necessary
5100 Reverts to last option
5110 Prints headings, replaces cursor
5120 Returns to main program
5130 Cursor keys revert to editing
5140 Auto repeat restored
5160-5200 Error reported

PROCEDURES

180 PROCPATTERN Displays the patterns, including the default pattern on the right hand side
250 PROCDISP Displays the brushes, speeds and sizes
340 PROCGREY Fills the screen with alternate black and white pixels for grey effect
360 PROCSQUARES Draws squares round the icon displays
430 PROCINIT Initialises variables, dimensions arrays, defines machine code labels
540 PROCMOVE Main routine in DRAW mode. Checks for any keypresses, before doing any painting
600 PROCPAINT
610 Skips if no movement made
620 Skips if action has not been started630 Separate routine for each brush, if within the drawing area
640-670 The PENCIL
680-690 The AIRBRUSH
700-740 The ERASER
750-780 The RECTANGLE
790-800 The radius of the circle
810-850 If no drawing action is started the cursor is moved. There is a slight delay to allow for coarseness in the FILL or ROLLER mode.
860 PROCCURS Draws box cursor round area to be rollered or typed on.
890 PROCCURS2 Draws small cursor for eraser routine
910 PROCKEY Checks for cursor keys to calculate change in position
990 PROCSHIFT The distance moved is increased if SHIFT has been pressed
1070 PROCCTRL The cursor moves to the side if CTRL is pressed
1140 PROCJOY The move is calculated using the joystick
1200 PROCPIK Diverts depending which set of ICONS has been chosen
1280 PROCICON Prints one of the ICONS for the brushes,speeds or sizes. If in OPTION 2 the Icon ICON is printed instead of the roller or fill.
1350 PROCSHOW Reverses chosen BRUSH, and cancels others
1370 PROCSPEED Reverses chosen speed or size, and cancels its opposite number
1480 FNLIM is true if X and Y are within the limits
1510 PROCSTART
1520 Skips if not within the drawing area
1530 Skips if an action is already started
1540 Sets start flag
1550 In the editing mode, the cursor is put in the centre of the gid square
1560 Initialises Icon in ICON mode
1570 There only remains DRAW mode, and the action depends onwhich brush is chosen
1580 The end of the line is defined at the centre of the cursor for the pencil, rectangle and circle
1590 Moves cursor to beginning of PRINTTAB position for roller
1600 The eraser starts at the centre of the cursor
1610-1630 Fills the chosen area
1640 Accesses the text procedure
1650 PROCSELECT checks for COPY, RETURN, DELETE or SPACE BAR being pressed
1710 PROCFIN Completes the drawing action
1810 PROCPIKPATTERN chooses and displays the pattern
1870 PROCPIKBRUSH Chooses and displays the brush
1940 PROCPIKSPEED Chooses and displays the speed or size
1970 PROCCANCEL Finishes the roller, airbrush or eraser action and cancels any lines or rectangles in progress
2080 PROCLINE Draws the line
2100 PROCSPOT Scatters dots for airbrush
2150 PROCROLL Rolls pattern of chosen width in the square cursor space
2190 PROCERASE Erases portion within the special cursor
2240 PROCFILL Fills up to boundary with current pattern
2310 PROCRECT Prints the rectangle
2340 PROCCIRC draws the circle
2430 PROCLET Allows typing from the keyboard until RETURN is pressed
2550 PROCSPRICON A% is 1 if the SPRICON is to be treated as a sprite, and 0 if it is used as an Icon.
2630 PROCHEAD Prints main options and choices
2760 PROCWIPE Wipes the drawing area
2800 PROCPIKOPTION Selects the appropriate option and carries out the DUMP,LOAD,SAVE or CAT options if necessary
2950 PROCPIKCHOICE Selects and carries out appropriate choice
3110 PROCGRID Defines dot grid to assist drawing
3170 PROCSURE Asks for confirmation
3220 PROCTECH Displays the Icons
3280 PROCDUMP Positive screen dump of the drawing area
3420 PROCTECHDR This is the main routine for the ICON option and includes the routine for moving Icons within the drawing area
3520 PROCPICKICON Chooses and displays the current Icon
3590 PROCLOAD Implements the LOAD routine
3690 PROCCAT Catalogues current filing system (can be terminated by ESCAPE)
3740 PROCSAVE Implements SAVE routine
3860 PROCDEFICON Main routine for Icon definition
3980 PROCBLACK Fills the grid square with black if 'Z' pressed or white if 'X' pressed
4030 PROCDEFINE Initialises Icon defining routines
4120 PROCCALC Continuously updates the Icon data
4190 FNVAR returns the number of the Icon byte currently being edited
4200 PROCFILENAME Allows filename to be input
4350 PROCWINDOW Sets up text window in pattern area (for CATaloguing etc)
4400 PROCREPLACE Removes text window and restores original patterns or Icons
4450 PROCPICKEDITOPTION Processes the newly-defined Icon according to your choice
4480 Bin: Forgets the Icon
4490 New Icon: Clears the grid, puts cursor in grid and starts editing routine

CONTINUED OVER

4510 Loads Icons from TAPE or DISC
4530 Save Icons on TAPE or DISC
4540 Prints Icon data in text window
4550 Keep Icon: Replaces current Icon with newly-defined one
4560 Edit: Puts the current Icon in the grid and starts the editing process
4570 PROCPRINT Sends Icon data to printer
4670 PROCKEEP Replaces current Icon and its data in memory with the new Icon and data
4740 PROCEDIT Transfers the chosen Icon to the new Icon area
4870 PROCEXPAND Expands the chosen Icon into the grid
4910 PROCCROSS Prints the cursor
4930 PROCUNGRID Deletes the dot grid if present

HEADER PROGRAM

```
   10REM***IKON**(C) A&B COMPUTING 1985
   20REM***AUTHOR MARGARET STANGER
   30MODE7:!&FE00=&10200A
   40PRINTTAB(1,0);CHR$151;STRING$(36,CHR$255)

50FORX%=1TO4:PRINTTAB(0,X%);CHR$141;CHR$151;CHR$255;:FORY%=0TO33:PRINT
CHR$(96+RND(26));:NEXT:PRINTTAB(37,X%);CHR$255:NEXT

60FORX%=5TO10:PRINTTAB(0,X%);CHR$141;CHR$151;CHR$255;:FORY%=0TO5:PRINT
CHR$(96+RND(26));:NEXT:PRINTTAB(31,X%);:FORY%=0TO5:PRINTCHR$(96+RND(26
));:NEXT:PRINTTAB(37,X%);CHR$255:NEXT

70FORX%=11TO14:PRINTTAB(0,X%);CHR$141;CHR$151;CHR$255;:FORY%=0TO33:PRI
NTCHR$(96+RND(26));:NEXT:PRINTTAB(37,X%);CHR$255:NEXT
   80PRINTTAB(1,15);CHR$151;STRING$(36,CHR$255)
   90FORI%=0TO1:PRINTTAB(18,I%+7);"IKON":NEXT
  100IF PAGE>=&1900 Z%=&1900 ELSE Z%=&E00
  110VDU28,10,19,30,17
  120*K.0PA.=&1C00 MCH."IKON1" M
  130*FX138,0,128
```

IKON 1

```
   10REM IKON1
   20PROCDEF
   30PROCAS
   40PROCSPR
   50CHAIN"IKON2"
   60DEFPROCDEF
   70*FX20,3
   80VDU23,128,255,255,255,255,255,255,255,255
   90VDU23,129,255,255,247,255,255,247,255,255
  100VDU23,130,24,24,24,255,255,24,24,24
  110VDU23,131,255,187,255,187,255,187,255,187
  120VDU23,132,187,187,187,187,187,187,187,187
  130VDU23,133,170,170,170,170,170,170,170,170
  140VDU23,134,255,0,255,0,255,0,255,0
  150VDU23,135,255,255,255,255,0,0,0,0
  160VDU23,136,255,255,255,0,255,255,255,0
  170VDU23,137,254,254,254,254,254,254,254,254
  180VDU23,138,204,204,51,51,204,204,51,51
  190VDU23,139,8,8,8,127,8,8,8,0
  200VDU23,140,240,240,15,15,240,240,15,15
  210VDU23,141,240,240,240,240,15,15,15,15
  220VDU23,142,255,255,0,0,255,255,0,0
  230VDU23,143,170,85,170,85,170,85,170,85
  240VDU23,144,221,238,119,187,221,238,119,187
  250VDU23,145,0,0,0,0,0,0,0,0
  260VDU23,146,187,119,238,221,187,119,238,221
  270VDU23,147,0,0,0,8,0,0,0,0
  280VDU23,148,191,127,254,253,251,247,239,223
  290VDU23,149,0,0,0,255,0,0,0,255
  300VDU23,150,223,239,247,251,253,254,127,191
  310VDU23,151,24,24,24,255,129,129,129,255
  320VDU23,152,248,136,136,143,143,136,136,248
  330VDU23,153,32,16,8,4,2,1,128,64
  340VDU23,154,188,236,115,179,203,206,55,59
  350VDU23,155,128,65,34,20,8,20,34,65
  360VDU23,156,127,190,221,235,247,235,221,190
  370VDU23,157,0,102,153,0,0,102,153,0
  380VDU23,158,255,102,153,255,255,102,153,255
  390VDU23,159,126,126,189,195,126,126,189,195
  400VDU23,160,0,0,0,0,1,3,6,12
  410VDU23,161,0,0,124,204,196,100,60,24
  420VDU23,162,24,48,96,193,99,62,28,8
  430VDU23,163,48,96,192,128,0,0,0,0
  440VDU23,164,0,0,63,15,3,3,63,63
  450VDU23,165,0,0,248,248,192,192,224,224
  460VDU23,166,39,7,7,7,7,7,0,0
  470VDU23,167,224,224,224,224,224,224,0,0
  480VDU23,168,0,0,31,16,31,31,31,0
  490VDU23,169,0,0,224,32,252,228,228,4
  500VDU23,170,3,6,15,15,15,15,0,0
  510VDU23,171,252,0,0,0,0,0,0,0
  520VDU23,172,0,0,1,2,4,8,16,33
  530VDU23,173,0,0,248,24,40,72,136,8
  540VDU23,174,126,66,66,66,67,126,0,0
  550VDU23,175,16,32,64,128,0,0,0,0
  560VDU23,176,0,0,0,0,15,15,15,15
  570VDU23,177,0,0,0,0,248,248,248,248
  580VDU23,178,15,15,15,15,0,0,0,0
  590VDU23,179,248,248,248,248,0,0,0,0
  600VDU23,180,0,0,0,0,15,8,8,8
  610VDU23,181,0,0,0,0,240,16,16,16
  620VDU23,182,8,8,8,15,0,0,0,0
  630VDU23,183,16,16,16,240,0,0,0,0
  640VDU23,184,0,3,12,16,16,32,32,32
  650VDU23,185,0,192,48,8,8,4,4,4
  660VDU23,186,32,32,32,16,16,12,3,0
  670VDU23,187,4,4,4,8,8,48,192,0
  680VDU23,188,0,0,3,3,6,6,12,12
  690VDU23,189,0,0,192,192,96,96,48,48
  700VDU23,190,31,31,48,48,96,96,0,0
  710VDU23,191,248,248,12,12,6,6,0,0
  720VDU23,192,0,0,6,6,6,7,3,3
  730VDU23,193,0,0,96,96,96,224,192,192
  740VDU23,194,1,3,7,7,7,3,0,0
  750VDU23,195,128,192,224,224,224,192,0,0
  760VDU23,196,0,0,0,0,99,119,127,63
  770VDU23,197,0,0,0,0,224,240,248,252
  780VDU23,198,31,8,24,56,0,0,0,0
  790VDU23,199,252,8,24,56,0,0,0,0
  800VDU23,200,0,0,0,0,0,0,0,1
  810VDU23,201,0,0,0,0,0,0,0,128
  820VDU23,202,1,0,0,0,0,0,0,0
  830VDU23,203,128,0,0,0,0,0,0,0
  840VDU23,204,0,0,0,0,0,0,0,3
  850VDU23,205,0,0,0,0,0,0,0,192
  860VDU23,206,3,0,0,0,0,0,0,0
  870VDU23,207,192,0,0,0,0,0,0,0
  880VDU23,208,0,0,0,0,0,0,2,0
  890VDU23,209,0,0,0,0,0,0,32,0,128
  900VDU23,210,0,2,0,0,0,0,0,0
  910VDU23,211,0,64,0,0,0,0,0,0
  920VDU23,212,0,0,0,0,0,4,1,0,4
  930VDU23,213,0,0,0,0,128,8,32,0,144
  940VDU23,214,0,2,0,8,0,0,0,0
  950VDU23,215,0,64,8,128,0,0,0,0
  960VDU23,216,0,0,0,0,0,7,7,7
  970VDU23,217,0,0,0,0,224,224,224,224
  980VDU23,218,7,7,7,7,0,0,0,0
  990VDU23,219,224,224,224,224,0,0,0,0
 1000VDU23,220,0,0,0,0,63,63,63,63
 1010VDU23,221,0,0,0,0,252,252,252,252
 1020VDU23,222,63,63,63,63,0,0,0,0
 1030VDU23,223,252,252,252,252,0,0,0,0
 1040VDU23,224,0,0,0,15,16,31,8,8
 1050VDU23,225,0,0,0,240,8,248,16,16
 1060VDU23,226,10,10,10,10,10,15,0,0
 1070VDU23,227,80,80,80,80,80,240,0,0
 1080VDU23,228,0,78,74,74,74,74,74,110
 1090VDU23,229,0,236,170,170,234,170,170,172
 1100VDU23,230,0,1,3,7,7,15,15,0
 1110VDU23,231,0,128,192,224,224,240,240,0
 1120VDU23,232,0,119,85,69,119,21,117,0
 1130VDU23,233,0,86,84,84,86,84,38,0
 1140VDU23,234,0,1,3,7,7,15,15,0
 1150VDU23,235,0,128,192,224,224,240,240,0
 1160VDU23,236,0,0,42,32,32,44,35,32
 1170VDU23,237,0,0,172,4,196,52,4,4
 1180VDU23,238,32,44,35,32,32,63,0,0
 1190VDU23,239,4,196,52,4,4,252,0,0
 1200VDU23,240,0,86,84,100,102,84,86,0
 1210VDU23,241,0,220,148,156,208,144,208,0
 1220VDU23,242,0,1,3,7,7,15,15,0
 1230VDU23,243,0,128,192,224,224,240,240,0
 1240VDU23,244,0,59,42,42,43,42,43,0
 1250VDU23,245,0,168,40,40,168,56,168,0
 1260VDU23,246,0,0,0,0,0,0,0,0
 1270VDU23,247,0,0,0,0,0,0,0,0
 1280VDU23,248,0,46,42,40,40,40,42,46
 1290VDU23,249,0,238,170,170,170,170,170,234
 1300VDU23,250,0,1,3,7,7,15,15,0
 1310VDU23,251,0,128,192,224,224,240,240,0
 1320VDU23,252,0,0,0,0,0,0,0,0
 1330VDU23,253,0,0,0,0,0,0,0,0
 1340VDU23,254,0,0,0,0,0,0,0,0
 1350VDU23,255,0,0,0,0,0,0,0,0
 1360ENDPROC
 1370DEFPROCAS
 1380FORPASS=0TO2STEP2
 1390P%=&5480
 1400[OPTPASS
 1410.PIC LDY#15
 1420.P1 LDA(&70),Y
 1430STA&8F:LDA#0:SBC&8F
 1440STA(&80),Y
 1450DEY:TYA:BPL P1
 1460CLC:LDA&80:ADC#&40:STA&80
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1470LDA&81:ADC%&1:STA&81
1480CLC:LDA&70:ADC%&10:STA&70
1490LDA&71:ADC%0:STA&71
1500LDY%15:.P2 LDA(&70),Y
1510STA&8F:LDA%0:SBC&8F
1520STA(&80),Y
1530DEY:TYA:BPLP2
1540RTS
1550.FILLDOWN LDY%0
1560.ACROSSD LDA(&84),Y:CMP%128:BMI FULL
1570JSR SCAN:INY:TYA:CMP%8:BNE ACROSSD:RTS
1580.FULL LDA%1:STA&82:RTS
1590.FILLUP LDY%7
1600.ACROSS LDA(&84),Y:CMP%128:BMI FULL
1610JSR SCAN:DEY:TYA:BPL ACROSS:RTS
1620.SCAN LDA&84:STA&80:LDA&85:STA&81
1630.FRIGHT SEC:JSR UNIT
1640CLC:LDA&80:ADC%8:STA&80:LDA&81:ADC%0:STA&81
1650LDA&8A:BEQ FRIGHT
1660LDA&84:STA&80:LDA&85:STA&81
1670.FLEFT SEC:LDA&80:SBC%8:STA&80:LDA&81:SBC%0:STA&81:JSR UNITL
1680LDA&8A:BEQ FLEFT:RTS
1690.FLAG1L JMP FLAGL
1700.UNITL LDA%0:STA&8A:LDA%&FF:STA&8B
1710LDA&70,Y:STA&88:LDA(&80),Y:STA&89
1720LDA%1:BIT &89:BEQ FLAG1L
1730LDA%1:BIT&88:BEQ F2L
1740LDA&8B:SBC%1:STA&8B
1750.F2L LDA%2:BIT &89:BEQ FLAG1L
1760LDA%2:BIT&88:BEQ F3L
1770LDA&8B:SBC%2:STA&8B
1780.F3L LDA%4:BIT &89:BEQ FLAGL
1790LDA%4:BIT&88:BEQ F4L
1800LDA&8B:SBC%4:STA&8B
1810.F4L LDA%8:BIT &89:BEQ FLAGL
1820LDA%8:BIT&88:BEQ F5L
1830LDA&8B:SBC%8:STA&8B
1840.F5L LDA%16:BIT &89:BEQ FLAGL
1850LDA%16:BIT&88:BEQ F6L
1860LDA&8B:SBC%16:STA&8B
1870.F6L LDA%32:BIT &89:BEQ FLAGL
1880LDA%32:BIT&88:BEQ F7L
1890LDA&8B:SBC%32:STA&8B
1900.F7L LDA%64:BIT &89:BEQ FLAGL
1910LDA%64:BIT&88:BEQ F8L
1920LDA&8B:SBC%64:STA&8B
1930.F8L LDA%128:BIT &89:BEQ FLAGL
1940LDA%128:BIT&88:BEQ F9L
1950LDA&8B:SBC%128:STA&8B
1960.F9L JMP F9
1970.FLAGL JMP FLAG
1980.UNIT LDA%0:STA&8A:LDA%&FF:STA&8B
1990LDA&70,Y:STA&88:LDA(&80),Y:STA&89
2000LDA%128:BIT &89:BEQ FLAGL
2010LDA%128:BIT&88:BEQ F2
2020LDA&8B:SBC%128:STA&8B
2030.F2 LDA%64:BIT &89:BEQ FLAGL
2040LDA%64:BIT&88:BEQ F3
2050LDA&8B:SBC%64:STA&8B
2060.F3 LDA%32:BIT &89:BEQ FLAG
2070LDA%32:BIT&88:BEQ F4
2080LDA&8B:SBC%32:STA&8B
2090.F4 LDA%16:BIT &89:BEQ FLAG
2100LDA%16:BIT&88:BEQ F5
2110LDA&8B:SBC%16:STA&8B
2120.F5 LDA%8:BIT &89:BEQ FLAG
2130LDA%8:BIT&88:BEQ F6
2140LDA&8B:SBC%8:STA&8B
2150.F6 LDA%4:BIT &89:BEQ FLAG
2160LDA%4:BIT&88:BEQ F7
2170LDA&8B:SBC%4:STA&8B
2180.F7 LDA%2:BIT &89:BEQ FLAG
2190LDA%2:BIT&88:BEQ F8
2200LDA&8B:SBC%2:STA&8B
2210.F8 LDA%1:BIT &89:BEQ FLAG
2220LDA%1:BIT&88:BEQ F9
2230LDA&8B:SBC%1:STA&8B
2240.F9 LDA&8B:STA(&80),Y:RTS
2250.FLAG LDA&8B:AND(&80),Y:STA(&80),Y
2260LDA%1:STA&8A:RTS
2270.BLACK CLC:LDA&85:ADC&86:STA&85:JMP WHITE
2280.XLOOP LDA%0:STA&85:LDA%128:STA&86
2290CLC:LDA&88:ADC%32:STA&82
2300LDA&89:ADC%0:STA&83
2310.PRCHAR LDA%0:STA&87
2320.P1 LDY%0:LDX%&80:LDA%9:JSR&FFF1
2330LDA&84:BEQ BLACK
2340.WHITE CLC:ROR&86
2350SEC:LDA&82:SBC%4:STA&82
2360LDA&83:SBC%0:STA&83
2370INC&87:LDA&87:CMP%8:BNE P1
2380LDA%1:JSR&FFEE:LDA&85:JSR&FFEE
2390CLC:LDA&80:ADC%4:STA&80
2400LDA&81:ADC%0:STA&81
2410LDA&80:CMP%&3C:BNE XLOOP
2420LDA&81:CMP%4:BNE XLOOP
2430LDA%1:JSR&FFEE:LDA%10:JSR&FFEE
2440RTS
2450¿
2460NEXT:ENDPROC
2470DEFPROCSPR
2480FORI%=0TO255:READA%:?(&1500+I%)=A%:NEXT
2490FORI%=0TO&2FCSTEP4:!(&1600+I%)=!(Z%+I%):NEXT
2500ENDPROC
2510DATA1,1,1,1,1,127,64,127
2520DATA0,8,28,8,0,252,4,252
2530DATA0,127,127,127,1,1,1,1
2540DATA0,252,252,252,0,0,0,0
2550DATA0,0,0,0,63,63,0,15
2560DATA128,128,128,128,254,254,0,248
2570DATA15,0,7,7,0,1,1,0
2580DATA248,0,240,240,0,192,192,0
2590DATA0,0,7,4,4,4,4,4
2600DATA128,128,240,16,16,16,16,16
2610DATA4,4,4,4,4,7,0,0
2620DATA16,16,16,16,16,240,128,128
2630DATA0,0,0,14,14,14,14,14
2640DATA0,0,0,224,224,224,224,224
2650DATA254,14,14,14,14,14,0,0
2660DATA254,224,224,224,224,224,0,0
2670DATA0,0,7,4,4,4,4,4
2680DATA128,128,240,16,16,20,24,31
2690DATA4,4,4,4,4,7,0,0
2700DATA24,20,16,16,16,240,128,128
2710DATA0,0,1,1,1,1,1,255
2720DATA4,4,196,68,68,72,80,96
2730DATA1,1,1,1,1,0,0,0
2740DATA96,92,88,84,196,4,4,4
2750DATA0,0,0,0,15,16,33,2
2760DATA128,128,130,132,248,128,64,32
2770DATA4,15,0,0,0,0,0,0
2780DATA16,248,128,128,128,128,128,128
2790DATA0,0,0,0,3,2,2,2
2800DATA0,0,0,0,16,144,80,48
2810DATA254,2,2,2,3,2,0,0
2820DATA31,48,80,144,16,16,0,0
```

IKON 2

```
  10REM IKON2
  20PROCINIT
  30MODE4
  40PROCGREY
  50PROCDISP
  60PROCPATTERN
  70PROCWIPE
  80PROCHEAD
  90ONERRORGOTO4990
 100VDU5:PROCCROSS:MOVEX,Y
 110REPEAT
 120ONOPTION+1 GOTO130,140,150
 130PROCMOVE:GOTO160
 140PROCTECHDR:GOTO160
 150PROCDEFICON
 160UNTILFALSE
 170END
 180DEFPROCPATTERN
 190COLOUR0:COLOUR129

200FORY%=27TO28:FORX%=128TO143:PRINTTAB(2*(X%-128)+1,Y%)CHR$X%;CHR$X%:
NEXT:NEXT

210FORY%=29TO30:FORX%=144TO159:PRINTTAB(2*(X%-144)+1,Y%)CHR$X%;CHR$X%:
NEXT:NEXT

220COLOUR0:COLOUR129:PRINTTAB(36,28);CHR$PATTERN;CHR$PATTERN:PRINTTAB(
36,29);CHR$PATTERN;CHR$PATTERN
  230!&70=!(&C00+8*(PATTERN-128)):!&74=!(&C04+8*(PATTERN-128))
  240COLOUR1:COLOUR128:PROCSQUARES(1,26,33,30,64,1):ENDPROC
  250DEFPROCDISP
  260VDU4:COLOUR0:COLOUR129
  270FORICON=0TO15:PROCICON:NEXT
  280BRUSH=0:SPEED=2:THICK=1:SPRAY=2:WIDE=1

290COLOUR128:COLOUR1:ICON=0:PROCICON:ICON=8:PROCICON:ICON=10:PROCICON:
ICON=13:PROCICON:ICON=14:PROCICON
  300COLOUR0:COLOUR129:VDU5
  310PROCSQUARES(35,7,39,15,64,0):PROCSQUARES(35,17,39,25,64,0)
  320PROCSQUARES(35,26,39,30,128,0)
  330VDU4:ENDPROC
  340DEFPROCGREY
  350FORSCREEN=&5800 TO &7FFF STEP4:!SCREEN=&55AA55AA:NEXT:ENDPROC
  360DEFPROCSQUARES(MINX,MINY,MAXX,MAXY,SIZE,COL)
  370VDU5:GCOL0,COL
  380FORMX=MINX*32 TO MAXX*32 STEPSIZE
  390MOVEMX,(31-MINY)*32-4:DRAWMX,(31-MAXY)*32-4:NEXT
  400FORMX=(31-MAXY)*32-4 TO(31-MINY)*32-4STEPSIZE
  410MOVEMINX*32,MX:DRAW32*MAXX,MX:NEXT
  420VDU4:ENDPROC
  430DEFPROCINIT
  440*FX20,3
  450SPREDIT=0
  460XLOOP=&5681:PIC=&5480:FILLUP=&54D2:FILLDOWN=&54BB
  470*FX4,1
  480X=511:Y=511
  490SPR=0:PATTERN=128:!&70=!&C00:!&74=!&C04
  500START=FALSE:JOY=0:EDITOPTION=0
  510DIMCHOICE(5):CHOICE(4)=1:CHOICE(0)=1
  520LAST=0:OPTION=0
  530ENDPROC
  540DEFPROCMOVE
  550*FX15,1
  560DX=0:DY=0
  570PROCSELECT
  580IF JOY=0 PROCKEY ELSE PROCJOY
  590PROCPAINT:ENDPROC
  600DEFPROCPAINT
  610IFDX=0 AND DY=0 ENDPROC
```

CONTINUED OVER

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 620IFSTART=FALSE GOTO810
 630ONBRUSH+1GOTO640,680,720,700,850,750,790,850
 640PROCLINE(0):IFTHICK=2 PROCLINE(4)
 650X=X+DX:Y=Y+DY:IFNOTFNLIM(28,188,1087,932) X=X-DX:Y=Y-DY
 660PROCLINE(0):IFTHICK=2 PROCLINE(4)
 670ENDPROC
680PROCCROSS:X=X+DX:Y=Y+DY:IFFNLIM(16+WIDE*16,204+WIDE*16,1072-WIDE*16
,944-WIDE*16) PROCSPOT ELSEX=X-DX:Y=Y-DY
 690PROCCROSS:ENDPROC
 700PROCCURS2:X=X+DX:Y=Y+DY:IFFNLIM(28+4*THICK,192,1087,928)
PROCERASE ELSEX=X-DX:Y=Y-DY
 710PROCCURS2:ENDPROC
 720DX=32*(SGN(DX)):DY=32*(SGN(DY))
 730PROCCURS:X=X+DX:Y=Y+DY:IFFNLIM((WIDE*32)-5,204,1067,932) PROCROLL
ELSEX=X-DX:Y=Y-DY
 740PROCCURS:Z=INKEY(50/SPEED):ENDPROC
 750PROCRECT(0):IFTHICK=2 PROCRECT(4)
 760X=X+DX:Y=Y+DY:IFNOTFNLIM(32,192,1087,930) X=X-DX:Y=Y-DY
 770PROCRECT(0):IFTHICK=2 PROCRECT(4)
 780ENDPROC
 790PROCLINE(0):X=X+DX:Y=Y+DY:IFNOTFNLIM(28,192,1087,930)
X=X-DX:Y=Y-DY
 800PROCLINE(0):ENDPROC
 810PROCCROSS
 820IFBRUSH=4 AND OPTION=0 DX=32*SGN(DX):DY=32*SGN(DY)
 830X=X+DX:Y=Y+DY
 840PROCCROSS:IFBRUSH=4 AND OPTION=0 Z=INKEY(50/SPEED)
 850ENDPROC
 860DEFPROCCURS
 870IF BRUSH=7 BOX=1 ELSE BOX=WIDE

880MOVEX+28,Y+4:DRAWX+28,Y-28:DRAWX-4-32*(BOX-1),Y-28:DRAWX-4-32*(BOX-
1),Y+4:DRAWX+28,Y+4:MOVEX,Y:ENDPROC
 890DEFPROCCURS2

900MOVEX+4,Y-4:DRAWX-4-4*THICK,Y-4:DRAWX-4-4*THICK,Y+4*SPEED:DRAWX+4,Y
+4*SPEED:DRAWX+4,Y-4:ENDPROC
 910DEFPROCKEY
 920IFINKEY(-26)ANDX>31 DX=-4*SPEED
 930IFINKEY(-122)ANDX<1215 DX=4*SPEED
 940IFINKEY(-58)ANDY<992 DY=4*SPEED
 950IFINKEY(-42)ANDY>63 DY=-4*SPEED
 960IFINKEY(-1) PROCSHIFT
 970IFINKEY(-2) PROCCTRL
 980ENDPROC
 990DEFPROCSHIFT
1000IF START=TRUE ENDPROC
1010IFDX>0 ANDX>1215 ENDPROC
1020IFDX<0 ANDX<64 ENDPROC
1030IFDY>0 ANDY>960 ENDPROC
1040IFDY<0 ANDY<64 ENDPROC
1050DX=32*(SGN(DX)):DY=32*(SGN(DY)):ENDPROC
1060ENDPROC
1070DEFPROCCTRL
1080IF START=TRUE ENDPROC
1090IF DX>0 DX=1200-X
1100IF DY>0 DY=980-Y
1110IF DY<0 DY=64-Y
1120IF DX<0 DX=64-X
1130ENDPROC
1140DEFPROCJOY
1150IFADVAL(1)DIV256>&E8 ANDX>31 DX=-4*SPEED
1160IFADVAL(1)DIV256<&18 ANDX<1215 DX=4*SPEED
1170IFADVAL(2)DIV256<&18 ANDY>31 DY=-4*SPEED
1180IFADVAL(2)DIV256>&E8 ANDY<991 DY=4*SPEED
1190ENDPROC
1200DEFPROCPIK
1210IFFNLIM(31,959,1057,1000) PROCPIKOPTION
1220IFFNLIM(1104,808,1280,1000) PROCPIKCHOICE
1230IFFNLIM(32,32,1056,160)PROCPIKPATTERN
1240IFFNLIM(1104,212,1280,464) PROCPIKSPEED
1250IFFNLIM(1104,528,1280,776) PROCPIKBRUSH
1260IF OPTION=2 ANDFNLIM(32,320,480,384)PROCPIKEDITOPTION
1270ENDPROC
1280DEFPROCICON
1290IFICON>7 DOWN=10 ELSE DOWN=8
1300PRINTTAB(35+2*(ICONMOD2),DOWN+2*(ICONDIV2))CHR$(160+4*ICON);CHR$(
161+4*ICON)
1310PRINTTAB(35+2*(ICONMOD2),1+DOWN+2*(ICONDIV2))CHR$(162+4*ICON);CHR
$(163+4*ICON)
1320IFICON=2 AND(OPTION=1 OR (OPTION>2 ANDLAST=1))
PRINTTAB(35,10);CHR$248;CHR$249:PRINTTAB(35,11);CHR$250;CHR$251
1330IFICON=4 AND(OPTION=1 OR (OPTION>2 ANDLAST=1))
PRINTTAB(35,12);CHR$248;CHR$249:PRINTTAB(35,13);CHR$250;CHR$251
1340ENDPROC
1350DEFPROCSHOW
1360VDU5:PROCCROSS:VDU4:COLOUR1:COLOUR128:PROCICON:VDU5:PROCCROSS:END
PROC
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1370DEFPROCSPEED
1380VDU4:COLOUR0:COLOUR129
1390IFICON=8 SPEED=2:ICON=9:GOTO1470
1400IFICON=9 SPEED=1:ICON=8
1410IFICON=10 THICK=1:ICON=11:GOTO1470
1420IFICON=11 THICK=2:ICON=10
1430IFICON=12 SPRAY=1:ICON=13:GOTO1470
1440IFICON=13 SPRAY=2:ICON=12
1450IFICON=14 WIDE=1:ICON=15:GOTO1470
1460IFICON=15 WIDE=2:ICON=14
1470PROCICON:VDU5:ENDPROC
1480DEFFNLIM(MINX,MINY,MAXX,MAXY)
1490F=FALSE:IF X<=MAXX ANDX>=MINX AND Y>=MINY AND Y<=MAXY F=TRUE
1500=F
1510DEFPROCSTART
1520IFNOTFNLIM(27,191,1089,937) ENDPROC ELSEIF(OPTION=1 AND(BRUSH=2
OR BRUSH=4))ANDNOTFNLIM(27,256,1025,933) ENDPROC
1530IFSTART=TRUE ENDPROC
1540START=TRUE
1550IFOPTION=2 PROCCROSS:X=32*(X DIV32):Y=32*(Y
DIV32)-4:PROCCROSS:ENDPROC
1560IFOPTION=1 AND(BRUSH=2 OR BRUSH=4)
PROCCROSS:MOVEX,Y:PROCSPRICON(1):ENDPROC
1570ON BRUSH+1 GOTO1580,1630,1590,1600,1610,1580,1580,1640
1580PROCCROSS:X=X+16:Y=Y-12:ENDX=X:ENDY=Y:ENDPROC
1590PROCCROSS:X=32*(X DIV32):Y=32*((Y+32)DIV 32)-1:PROCCURS:ENDPROC
1600PROCCROSS:X=X+16:Y=Y-12:PROCCURS2:ENDPROC
1610PROCCROSS:IF CHOICE(3)=1 PROCGRID
1620START=FALSE:PROCFILL:PROCCROSS:IF CHOICE(3)=1 PROCGRID
1630ENDPROC
1640PROCLET:ENDPROC
1650DEFPROCSELECT
1660IFINKEY(-106) AND START=FALSE PROCPIK
1670IFINKEY(-74) PROCFIN
1680IFINKEY(-99) PROCSTART
1690IFINKEY(-90) PROCCANCEL
1700ENDPROC
1710DEFPROCFIN
1720IFNOTFNLIM(27,191,1089,937) ENDPROC
1730IF START=FALSE ENDPROC
1740IFBRUSH=6 PROCCIRC(0):IF THICK=2 PROCCIRC(4)
1750START=FALSE:IF OPTION<>2 AND(BRUSH=0 OR BRUSH>4)
X=X-16:Y=Y+12:PROCCROSS
1760IFOPTION=2 ENDPROC
1770IF BRUSH=2 AND OPTION=0 PROCCURS:PROCCROSS
1780IF BRUSH=3 PROCCURS2:X=X-16:Y=Y+12:PROCCROSS
1790IFOPTION=1AND (BRUSH=4 OR BRUSH=2) PROCCROSS
1800ENDPROC
1810DEFPROCPIKPATTERN
1820VDU7:IF OPTION<>0 PROCPIKICON:ENDPROC
1830PATTERN=128+16*((159-Y)DIV64)+(X-24)DIV64
1840VDU4:COLOUR0:COLOUR129:PRINTTAB(36,28);CHR$PATTERN;CHR$PATTERN:PR
INTTAB(36,29);CHR$PATTERN;CHR$PATTERN
1850!&70=!(&C00+8*(PATTERN-128)):!&74=!(&C04+8*(PATTERN-128))
1860VDU5:GCOL3,1:ENDPROC
1870DEFPROCPIKBRUSH
1880VDU7:VDU4:COLOUR129:COLOUR0:FORICON=0TO7:PROCICON:NEXT
1890ICON=(X-1104)DIV64+2*((776-Y)DIV64)
1900COLOUR128:COLOUR1:PROCSHOW:PROCSQUARES(35,7,39,15,64,0):BRUSH=ICO
N:VDU5:GCOL3,1
1910IFBRUSH=3
ICON=14:PROCSHOW:PROCSPEED:PROCSQUARES(35,17,39,25,64,0):VDU5:GCOL3,1
1920IFBRUSH=4 AND OPTION=0 PROCCROSS:X=32*(X DIV 32)-16:Y=32*(Y DIV
32)+12:PROCCROSS
1930ENDPROC
1940DEFPROCPIKSPEED
1950VDU7:ICON=8+(X-1104)DIV64+2*((464-Y)DIV64)
1960PROCSHOW:PROCSPEED:PROCSQUARES(35,17,39,25,64,0):VDU5:GCOL3,1:END
PROC
1970DEFPROCCANCEL
1980IFSTART=FALSE OR OPTION=2 ENDPROC
1990ON BRUSH+1 GOTO2000,2060,2060,2060,2060,2020,2050,2060
2000PROCLINE(0):IFTHICK=2 PROCLINE(4)
2010PROCFIN:ENDPROC
2020PROCRECT(0):IFTHICK=2 PROCRECT(4)
2030PROCFIN:ENDPROC
2040BRUSH=0:PROCPAINT:PROCFIN:BRUSH=6:ENDPROC
2050PROCLINE(0):PROCCROSS:START=FALSE:ENDPROC
2060IFOPTION=1AND(BRUSH=2 OR BRUSH=4) MOVEX,Y:PROCSPRICON(1)
2070PROCFIN:ENDPROC
2080DEFPROCLINE(W%)
2090MOVEX+W%,Y+W%:PLOT13,ENDX+W%,ENDY+W%:ENDPROC
2100DEFPROCSPOT
2110GCOL0,0
2120FORI%=1 TO SPRAY
2130MOVEX,Y:PLOT69,X+16+RND(16*WIDE),Y-16+RND(16*WIDE):PLOT69,X+16-RN
D(16*WIDE),Y-16-RND(16*WIDE):GCOL3,1
2140NEXT:ENDPROC
2150DEFPROCROLL
2160ON WIDE GOTO2170,2180
2170GCOL0,1:MOVEX,Y:PRINTCHR$128:GCOL3,128:GCOL3,1:MOVEX,Y:PRINTCHR$P
ATTERN;:MOVEX,Y:GCOL3,1:ENDPROC
2180GCOL0,1:MOVEX-32,Y:PRINTCHR$128;CHR$128:GCOL3,1:MOVEX-32,Y:PRINTC
HR$PATTERN;CHR$PATTERN;:MOVEX,Y:GCOL3,1:ENDPROC
```

```
 2190DEFPROCERASE
 2200IFWIDE=2 GCOL0,0 ELSE GCOL0,1
 2210MOVEX,Y:DRAWX-DX,Y-DY
 2220IFTHICK=2 MOVEX-4,Y-4:DRAWX-4-DX,Y-4-DY
 2230GCOL3,1:ENDPROC
 2240DEFPROCFILL
 2250XX=X:YY=Y:Y=32*((Y-12)DIV 32):X=32*((X+16)DIV32):REPEAT
 2260!&80=HIMEM+8*(X DIV 32)
 2270!&80=!&80+10*(992-Y):!&84=!&80:CALLFILLUP:Y=Y+32:UNTIL?&82=1
 2280?&82=0:Y=32*((YY-32) DIV 32)
 2290REPEAT:!&80=HIMEM+8*(X DIV
32)+10*(992-Y):!&84=!&80:CALLFILLDOWN:Y=Y-32:UNTIL?&82=1
 2300X=XX:Y=YY:ENDPROC
 2310DEFPROCRECT(WX)
 2320WX=WX*SGN(X-ENDX):WY=WX*SGN(Y-ENDY)
 2330MOVEX-WX,Y-WY:PLOT13,ENDX+WX,Y-WY:PLOT13,ENDX+WX,ENDY+WY:PLOT13,X
-WX,ENDY+WY:PLOT13,X-WX,Y-WY:ENDPROC
 2340DEFPROCCIRC(WX)
 2350IFWX=0 PROCLINE(0)
 2360XX=X:YY=Y:GCOL0,0
 2370RX=SQR((X-ENDX)^2+(Y-ENDY)^2)-WX
 2380N=2*PI/120:C=COS(N):S=SIN(N):B=1/SQR(2):D=1/SQR(2)
 2390FORI%=1TO121
 2400R=B*C-D*S:T=B*S+D*C:B=R:D=T:X=B*RX+ENDX:Y=D*RX+ENDY
 2410IFI%>1 ANDFNLIM(31,200,1087,937) PLOT5,X,Y ELSE MOVEX,Y
 2420NEXT:GCOL3,1:X=XX:Y=YY:ENDPROC
 2430DEFPROCLET
 2440*FX11,0
 2450*FX4
 2460PROCCROSS:X=32*(X DIV 32):PROCCURS
 2470*FX15,1
 2480REPEAT:A=GET:PROCCURS
 2490IFA=127 GCOL0,1:X=X-32:MOVEX,Y:PRINTCHR$128:MOVEX,Y:GCOL0,0 ELSE
MOVEX,Y:PRINTCHR$A:X=X+32
 2500GCOL3,1:PROCCURS
 2510UNTILA=13 ORNOTFNLIM(63,200,1035,937)
 2520PROCCURS:IFA=13 X=X-32
 2530*FX4,1
 2540START=FALSE:PROCCROSS:ENDPROC
 2550DEFPROCSPRICON(A%)
 2560ONA%+1 GOTO2590,2570
 2570FORK%=0TO28STEP4:!(Z%+&2E0+K%)=!(&1500+SPR*32+K%):NEXT
 2580MOVEX,Y:PRINTCHR$252;CHR$253:MOVEX,Y-32:PRINTCHR$254;CHR$255:ENDP
ROC
 2590!&70=&1500+32*SPR:IFSPR>47 AND Z%<&1900 !&70=&A00+32*SPR
 2600!&80=HIMEM+8*(X DIV32)+320*((1024-Y)DIV32)
 2610CALL PIC
 2620ENDPROC
 2630DEFPROCHEAD
 2640VDU4:COLOUR128:COLOUR1
 2650RESTORE
 2660PRINTTAB(1,1);STRING$(33,CHR$128)
 2670COLOUR0:COLOUR129
 2680FORY%=0TO5:PRINTTAB(35,Y%+1);STRING$(4,CHR$128):NEXT
 2690FOR I%=0TO6:IFI%=OPTION COLOUR1:COLOUR128 ELSE COLOUR0:COLOUR129
 2700READ OPTION$:PRINTTAB(1+5*I%,1);OPTION$:NEXT
 2710FORI%=0TO5:READCHOICE$:IFCHOICE(I%)=0 COLOUR0:COLOUR129 ELSE
COLOUR1:COLOUR128
 2720PRINTTAB(35,I%+1);CHOICE$:NEXT
 2730DATADRAW,ICON,EDIT,DUMP,LOAD,SAVE,CAT
 2740DATA"KEY ",WIPE,"JOY ",GRID,DISC,TAPE
 2750VDU5:ENDPROC
 2760DEFPROCWIPE
 2770PROCUNGRID
 2780VDU4:COLOUR1:FORY%=3TO25:PRINTTAB(1,Y%);STRING$(33,CHR$128):NEXT:
VDU5:CHOICE(3)=0
 2790GCOL0,0:MOVE28,188:DRAW28,928:DRAW1088,928:DRAW1088,188:DRAW28,18
8:ENDPROC
 2800DEFPROCPIKOPTION
 2810VDU7:PROCUNGRID
 2820IFOPTION=2 PROCWIPE
 2830LAST=OPTION:IFLAST>2 LAST=0
 2840PROCCROSS:OPTION=(X-24)DIV160
 2850ONOPTION+1 GOTO2860,2870,2880,2890,2900,2910,2920
 2860VDU4:PROCPATTERN:PROCDISP:GOTO2940
 2870PROCTECH:PROCDISP:GOTO2940
 2880PROCDEFINE:PROCTECH:GOTO2940
 2890PROCDUMP:GOTO2930
 2900PROCLOAD:GOTO2930
 2910PROCSAVE:GOTO2930
 2920PROCCAT
 2930OPTION=LAST
 2940VDU5:GCOL3,1:PROCHEAD:PROCCROSS:ENDPROC
 2950DEFPROCPIKCHOICE
 2960VDU7:CHOICE=(1000-Y)DIV32
 2970PROCCROSS:IFCHOICE<>3 CHOICE(CHOICE)=1
 2980ON CHOICE+1 GOTO2990,3000,3020,3050,3070,3090
 2990JOY=0:CHOICE(2)=0:GOTO3100
 3000PROCHEAD:CHOICE(1)=0:PROCSURE:IFA$="Y" ORA$="y"
COLOUR128:COLOUR1:PROCWIPE:CHOICE(3)=0
 3010GOTO3100
 3020IFJOY<>1 CHOICE(0)=0:PROCHEAD:PROCSURE:IFA$="Y" ORA$="y" JOY=1
ELSECHOICE(2)=0:CHOICE(0)=1
 3030*FX15
 3040GOTO3100
 3050PROCGRID:IFCHOICE(3)=0 CHOICE(3)=1 ELSE CHOICE(3)=0
 3060GOTO3100
 3070CHOICE(5)=0:*D.
 3080GOTO3100
 3090CHOICE(4)=0:*T.
 3100PROCHEAD:PROCCROSS:ENDPROC
 3110DEFPROCGRID
 3120VDU5:GCOL3,1
 3130FORM%=112 TO 1008 STEP64
 3140FORN%=240TO920STEP64
 3150MOVEM%,N%:PLOT69,M%,N%:NEXT:NEXT
 3160ENDPROC
 3170DEFPROCSURE
 3180VDU4:COLOUR0:COLOUR129:PRINTTAB(1,1);STRING$(33,CHR$128)
 3190PRINTTAB(1,1);"ARE YOU SURE (Y/N)"
 3200*FX15,1
 3210A$=GET$:VDU4:ENDPROC
 3220DEFPROCTECH
 3230XX=X:YY=Y
 3240FORI%=0TO31:X=32+64*(I% MOD
16):Y=160-64*(I%DIV16):SPR=I%:PROCSPRICON(0):NEXT
 3250X=36*32:Y=128:SPR=SPREDIT
 3260PROCSPRICON(0):X=XX:Y=YY
 3270VDU4:COLOUR1:COLOUR128:PROCSQUARES(1,26,33,30,64,0):X=XX:Y=YY:VDU
5:GCOL3,1:ENDPROC
 3280DEFPROCDUMP
 3290VDU2
 3300XX=X:YY=Y
 3310VDU1,10,1,10,1,10
 3320VDU1,27,1,65,1,8
 3330FORY=895TO191STEP-32
 3340VDU1,27,1,75,1,7,1,1
 3350!&88=Y:!&80=32
 3360CALL XLOOP
 3370NEXT
 3380VDU1,27,1,65,1,10
 3390VDU3,7
 3400X=XX:Y=YY
 3410ENDPROC
 3420DEFPROCTECHDR
 3430*FX5,1
 3440DX=0:DY=0
 3450PROCSELECT
 3460IF JOY=0 PROCKEY ELSE PROCJOY
 3470IFDX=0 ANDDY=0 ENDPROC
 3480IFBRUSH<>2 AND BRUSH<>4 PROCPAINT:ENDPROC
 3490IF START=FALSE PROCCROSS:X=X+DX:Y=Y+DY:PROCCROSS:ENDPROC
 3500MOVEX,Y:PROCSPRICON(1):X=X+DX:Y=Y+DY:IFFNLIM(27,256,1025,933)
PROCSPRICON(1) ELSE X=X-DX:Y=Y-DY:PROCSPRICON(1)
 3510ENDPROC
 3520DEFPROCPIKICON
 3530SPR=16*((159-Y)DIV64)+(X-24)DIV64
 3540SPREDIT=SPR
 3550XX=X:YY=Y:X=36*32:Y=128
 3560PROCSPRICON(0)
 3570IF OPTION=2
Y=384:X=416:PROCSPRICON(0):PROCSQUARES(1,19,15,21,64,0)
 3580VDU5:GCOL3,1:X=XX:Y=YY:ENDPROC
 3590DEFPROCLOAD
 3600PROCUNGRID
 3610PROCFILENAME
 3620PROCSURE:IFA$<>"Y" ANDA$<>"y" ENDPROC
 3630PROCWINDOW:IFCHOICE(5)=1 VDU15
 3640$&147A="*LOAD":?&147F=32
 3650X%=&7A:Y%=&14:CALL&FFF7
 3660PROCREPLACE
 3670PROCDISP:VDU5:GCOL3,1
 3680ENDPROC
 3690DEFPROCCAT
 3700PROCWINDOW
 3710*CAT
 3720PRINT"PRESS RETURN TO CONTINUE":REPEAT:UNTILGET=13:PROCREPLACE
 3730ENDPROC
 3740DEFPROCSAVE
 3750PROCUNGRID
 3760PROCFILENAME
 3770PROCWINDOW
 3780IFCHOICE(5)=1 PRINT"PLEASE POSITION TAPE AND PRESS  SPACE
BAR":REPEAT:UNTILGET=32
 3790$&147A="*SAVE":?&147F=32
 3800FORI%=0TO7:IF(?(&1480+I%)=13 OR?(&1480+I%)=0) ?(&1480+I%)=32
 3810NEXT
 3820IF LAST<>2 $&1488="5BC0 7880" ELSE $&1488="1500 1900"
 3830X%=&7A:Y%=&14:CALL&FFF7
 3840PROCREPLACE
 3850ENDPROC
 3860DEFPROCDEFICON
 3870DX=0:DY=0
```

CONTINUED OVER

PROGRAM LISTING 3

```
 3880IF JOY=0 PROCKEY ELSE PROCJOY
 3890PROCSELECT
 3900IFFNLIM(31,440,532,937) AND START=TRUE PROCBLACK
 3910IFDX=0 ANDDY=0 ENDPROC
 3920PROCCROSS
 3930IF START=TRUE DX=32*SGN(DX):DY=32*SGN(DY)
 3940X=X+DX:Y=Y+DY
 3950IF START=TRUE AND NOT FNLIM(31,444,532,937) X=X-DX:Y=Y-DY
 3960PROCCROSS:IFSTART=TRUE Z=INKEY(50)
 3970ENDPROC
 3980DEFPROCBLACK
 3990*FX15,1
 4000IFINKEY(-98) AND POINT(X,Y)=0 MOVEX,Y:PRINTCHR$128:PROCCALC
 4010IFINKEY(-67) AND POINT(X,Y)=1 MOVEX,Y:PRINTCHR$128:PROCCALC
 4020ENDPROC
 4030DEFPROCDEFINE
 4040IFEDITOPTION<1 OR EDITOPTION>2 PROCSURE:IFA$<>"Y" ANDA$<>"y"
ENDPROC
 4050PROCWIPE
 4060PROCSQUARES(1,2,17,18,32,0)
 4070FORI%=0TO31:?(&14E0+I%)=0:NEXT
 4080YY=Y:XX=X:FORI%=48TO53:X=32+64*(I%-48):Y=384:SPR=I%:PROCSPRICON(0
):NEXT
 4090SPR=SPREDIT:Y=384:X=416:PROCSPRICON(0):X=XX:Y=YY
 4100PROCSQUARES(1,19,15,21,64,0)
 4110EDITOPTION=0:ENDPROC
 4120DEFPROCCALC
 4130YPLACE=(936-Y)DIV 32:PLACE=16-(X DIV 32)
 4140DIGIT=2^(PLACE MOD8)
 4150?(FNVAR)=(?(FNVAR)EORDIGIT)
 4160SPR=-1:XX=X:YY=Y:X=544:Y=384:PROCSPRICON(0)
 4170X=XX:Y=YY
 4180VDU5:ENDPROC
 4190DEFFNVAR=(&14E8+(YPLACE MOD8)+16*(YPLACE DIV 8)-8*(PLACE DIV8))
 4200DEFPROCFILENAME
 4210*FX11,0
 4220*FX15,0
 4230*FX4
 4240VDU4:PRINTTAB(1,1);STRING$(26,CHR$128);STRING$(7,CHR$32)
 4250COLOUR0:COLOUR129:PRINTTAB(1,1);"ENTER
FILENAME":PRINTTAB(27,1);:COLOUR1:COLOUR128
 4260!&1480=0:!&1484=0
 4270LOCALX%,Y%
 4280!&70=&20071480
 4290?&74=127
 4300X%=&70:Y%=0:A%=0:CALL&FFF1
 4310?&1487=13
 4320*FX4,1
 4330*FX11,50
 4340ENDPROC
 4350DEFPROCWINDOW
 4360VDU14
 4370VDU4:COLOUR1:COLOUR128:FORI%=27TO30:PRINTTAB(1,I%);STRING$(32,CHR
$128):NEXT:PRINTTAB(1,27);
 4380VDU28,1,30,32,27
 4390ENDPROC
 4400DEFPROCREPLACE
 4410VDU26:IF LAST=0 OR OPTION=0 PROCPATTERN ELSE PROCTECH
 4420VDU5:GCOL3,1
 4430VDU15:!&70=!&C00:!&74=!&C04
 4440ENDPROC
 4450DEFPROCPIKEDITOPTION
 4460EDITOPTION=(X-24)DIV64
 4470ON EDITOPTION+1 GOTO4480,4510,4530,4540,4550,4490,4560
 4480PROCDEFINE:PROCHEAD:GCOL3,1:PROCCROSS:ENDPROC
 4490PROCDEFINE:PROCHEAD:GCOL3,1:IFA$="Y"
X=32:Y=928:PROCCROSS:PROCSTART
 4500ENDPROC
 4510LAST=2:PROCLOAD:PROCTECH:PROCHEAD:GCOL3,1
 4520ENDPROC
 4530LAST=2:PROCSAVE:PROCHEAD:GCOL3,1:ENDPROC
 4540LAST=2:PROCWINDOW:PROCPRINT:PROCREPLACE:ENDPROC
 4550PROCKEEP:ENDPROC
 4560PROCEDIT:X=32:Y=928:PROCCROSS:PROCSTART:ENDPROC
 4570DEFPROCPRINT
 4580VDU2
 4590PRINT"ICON ";SPREDIT
 4600FORK%=0TO3
 4610FORI%=0TO7
 4620PRINTSTR$(?(&14E0+I%+8*K%))+" ";
 4630NEXT
 4640PRINT
 4650NEXT:PRINT:PRINT
 4660VDU3:ENDPROC
 4670DEFPROCKEEP
 4680FORI%=0TO28STEP4:!(&1500+32*SPREDIT+I%)=!(&14E0+I%):NEXT
 4690YY=Y:XX=X:SPR=SPREDIT:Y=384:X=416:PROCSPRICON(0)
 4700PROCSQUARES(1,19,15,21,64,0)
 4710Y=YY:X=XX
 4720PROCTECH
 4730ENDPROC
 4740DEFPROCEDIT
 4750PROCWIPE
 4760PROCSQUARES(1,2,17,18,32,0)
 4770YY=Y:XX=X:FORI%=48TO53:X=32+64*(I%-48):Y=384:SPR=I%:PROCSPRICON(0
):NEXT
 4780SPR=SPREDIT:Y=384:X=416:PROCSPRICON(0)
 4790PROCSQUARES(1,19,15,21,64,0)
 4800FORI%=0TO28STEP4:!(&14E0+I%)=!(&1500+32*SPREDIT+I%):NEXT
 4810VDU5:GCOL3,1
 4820FORA%=0TO1:FORB%=0TO1
 4830PROCEXPAND
 4840NEXT:NEXT
 4850SPR=SPREDIT:Y=384:X=544:PROCSPRICON(0):X=XX:Y=YY
 4860ENDPROC
 4870DEFPROCEXPAND
 4880FORK%=0TO7
 4890T%=128:I%=0
 4900REPEAT
 4910IF(?(&14E0+K%+8*A%+16*B%)ANDT%)=T%
MOVE32*(1+I%+8*A%),(29-K%-8*B%)*32-4:PRINTCHR$128
 4920I%=I%+1:T%=T%/2:UNTILI%=8
 4930NEXT:ENDPROC
 4940DEFPROCCROSS
 4950GCOL3,1:MOVEX,Y:PRINTCHR$139;:ENDPROC
 4960DEFPROCUNGRID
 4970IF CHOICE(3)=1 CHOICE(3)=0:PROCGRID
 4980ENDPROC
 4990VDU3:REM ERROR ROUTINE
 5000VDU26
 5010*FX20,3
 5020*FX11,50
 5030IF ERR<189 ANDERR<>17 GOTO5130
 5040IF ERR =17 AND OPTION<3 GOTO5130
 5050IFERR<>17 PRINTTAB(2,26);:REPORT:PRINTTAB(2,28);"PRESS RETURN TO
CONTINUE":REPEAT:UNTILGET=13:PRINTTAB(0,27);CHR$143
 5060VDU26
 5070VDU4:VDU7
 5080PROCREPLACE:IF OPTION=3 Y=932
 5090IF LAST>2 LAST=0
 5100OPTION=LAST
 5110PROCHEAD:IFY>928 PROCCROSS
 5120GOTO110
 5130*FX4
 5140*FX11,50
 5150*FX15,0
 5160COLOUR0:COLOUR129
 5170VDU4:PRINTTAB(1,10);
 5180REPORT
 5190PRINT" AT LINE ";ERL
 5200END
>
```

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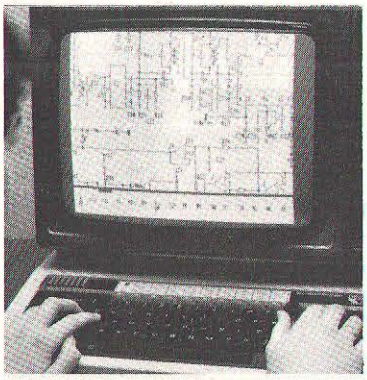

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FEATURES

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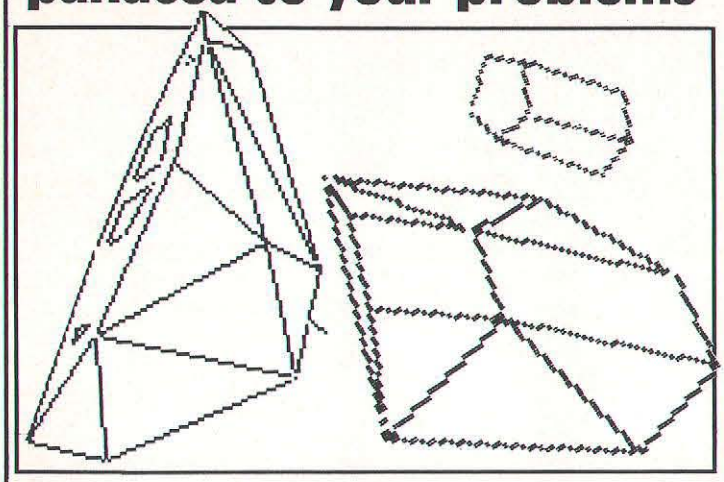
Feedback

Clive Grace

Look no further for the panacea to your problems



Welcome to another Feedback, the column where **you** can write in with queries and problems or just plain gossip (know a new game that's coming out?) This month, there have been a healthy lot of enquiries, especially printer problems, not to mention disc drives, second processors, modems.... read on!

ONLINE DATA

The first letter this month comes from *K Grimes* who is more than a little confused with all of the Bulletin Boards and closed user groups on Prestel. He says: "I wonder if you could enlighten me on how I can access a Bulletin board and Prestel. Also, who do I have to write to in order to ask if I can join the bulletin boards, especially Prestel. Also which modems could you recommend, and software to drive the modem".

Well Mr Grimes, there are a whole load of modems which are suitable but the kind you need is a multi standard modem because often bulletin boards and Prestel don't communicate using the same protocols. Generally, this is only a matter of speed, especially as many bulletin boards communicate at 300/300 baud and Prestel is mainly 1200/75 baud. Software is very important. There are lots of packages, and if you intend accessing only the services in your letter, ie you aren't thinking of using your modem to talk to a DEC10, then there are two very good packages to be recommended.

Commstar is one of the most popular packages available as it is also packaged with the Nightingale modem. The two packages are made for each other, but it will work with nearly all models (especially the ADM chip based modems). The other modem is the Demon modem, which I reviewed in last month's *A&B*. Again, the Demon modem comes with its own software package that is tailor made for the modem.

Bulletin boards are easy to come by, and are normally free. All you do is dial up the number given, wait for the tone, and start communicating — using whatever modem you have decided to go for. You may like to try Beeboard, a BBC dedicated bulletin board on 01 624 7460.

Prestel is another matter. As it is run by British Telecom, there is a tendency to go for BT approved modems, the Nightingale falls into this category, but not Demon... There are also closed user groups in Prestel — my favourite is VIEWFAX 258, offering plenty of information and software for the Beeb. Write to:

Viewfax Ltd,
King Edward Building,
205-219 Corporation Street,
Birmingham

and ask for a Prestel order form and Viewfax membership.

JOYSTICK FIX

Lieut M Northcott from HMS Hydra, has just purchased a BBC B as a family present and wants some information concerning joysticks:

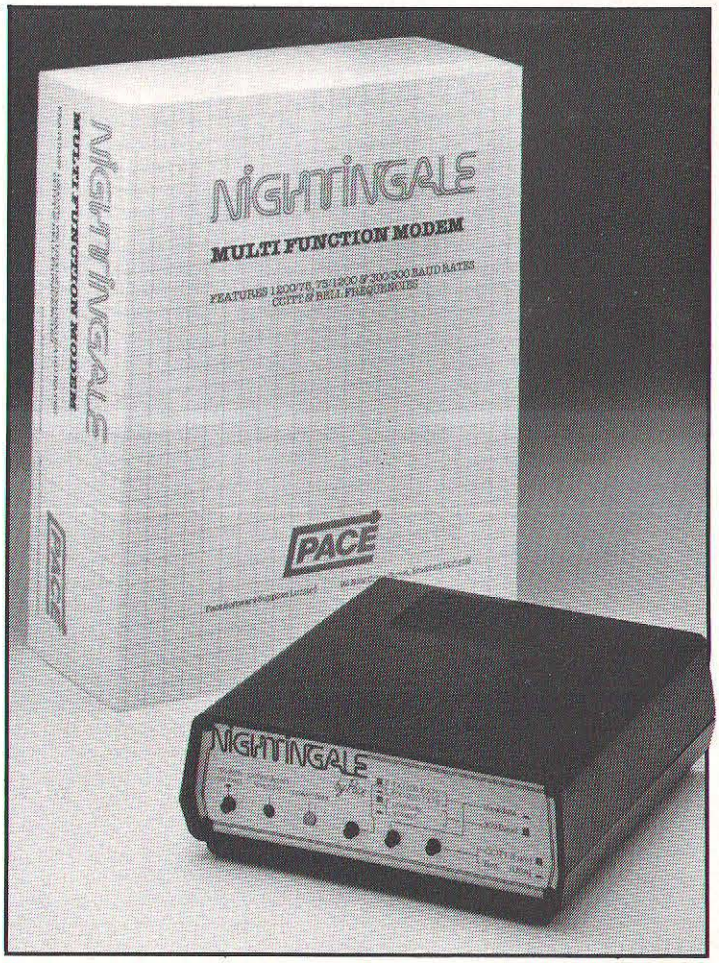
"What are the differences between joysticks and games paddles, is an interface needed to drive one? Will they work with all of the software on the Beeb, and could you recommend any Joysticks/Paddles?"

Games paddles, such as Acorn's own, are very popular with people who only play the odd game or two, as they can be used for other purposes — eg an input device using a CAD package or a synthesiser "bend" key. This would be difficult using a joystick as they are "self centering" which makes the joystick go back to the centre, like the joystick controllers in arcade games.

You may find that a trackball is the best thing for you, especially if you play a lot of *Missile Command*. Marconi manufacture an excellent tracker ball — the RB2, which works very well(for a full review, see *Rollerballs* in this issue.

HIT AND MISS

Giorgio Giamotti of Swindon is having a great deal of problems with his tapes. In his own words, the computer "refuses to SAVE



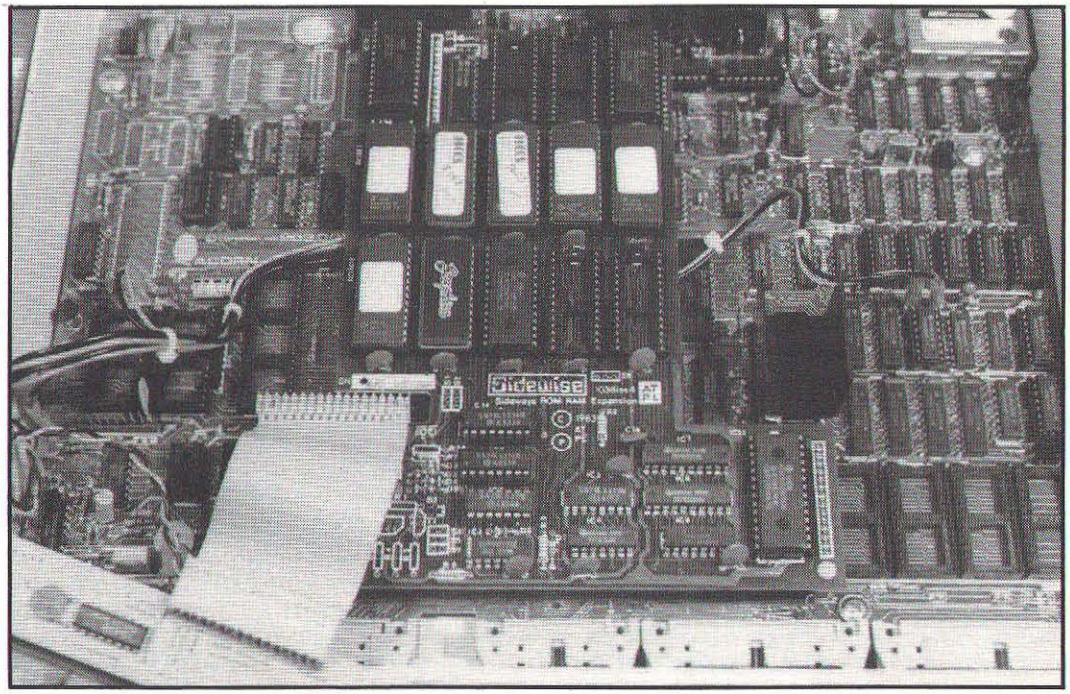
programs on tape, although it will LOAD programs from the cassette player which have been recorded on another machine. In addition, games and educational programs designed for the BBC which will load on another machine will not load on mine, how can I remedy this?". You could always buy a disc drive! But seriously, I have had exactly the same problem which on one occasion resulted in the destruction of the offending machine with a camping mallet. Definitely not recommended if you want to have any money left!

This isolated incident was five years ago, and since then more scientific solutions to the data cassette (lack of) quality problem have come to light. Firstly, connect up your Hi-Fi cassette recorder using a brand new, good quality tape. Make sure that the VU meter is on 100 Db (ie on the boundary between red and white). If it works, then breathe a sigh of relief as your cassette interface is not at fault. If it doesn't work, then you can be sure that a chip somewhere in the cassette interface is at fault. The best thing to do, is to send the machine back for replacement or repair.

Or, if you don't want to be parted from your Beeb for that length of time, you could buy Operation Caretaker, price £10.95 from Global Software. No, it's not another adventure game: it's a cassette head alignment adjuster which should solve the problems of loading errors. If you're suffering from drop-out (nasty!) the simple on-screen display lets you set things up accurately for maximum signal level. They even supply the screwdriver. Global are at PO Box 67, London SW11 1BS (01-228 1360).

WINDOW TO THE WORLD

Mike Davis of Dublin, is having a great deal of trouble setting up text windows. He writes: "When I define a text window, (Mode 1 in my case) what appears in this window is very sluggish when the screen is scrolled, as, for example, when a program is LISTed.



Even when I redefine the window to a full screen, this problem still remains, how can I get a text window without slowing down the text inside the window?"

This problem is an unusual one in that I have never heard of the text inside a text window being slowed down too much. Perhaps you are not using the VDU command table correcly, try typing in:
VDU28,11,22,30,20,
which is a typical text window. Also, check that you are not using VDU 5, so that the text is not being treated as a graphics character. If you are, this will slow down the display text inside a window, because it is plotting characters instead printing.

WORDIER ROM

T Angove of Cornwall, has come up with some interesting information concerning Wordwise Plus. He has found a bug in the continuous processing system, whereby you can lose data. It happens thus: "You load a file and alter it by deleting something, then you access the next document either forwards or backwards. Wordwise will first save your altered document before loading the next file. Unfortunately, it saves the file under its original filename, overwriting it, and thus wiping out the original longer file. This is fine if you don't want to the deleted information retained on the longer file, but if – like me you only deleted as an experiment....!?"

Thanks for the comments on Wordwise Plus, Mr Angove. I tried out your findings and you are quite right. The problem is not so much of a bug, it is more of an annoyance as I think that the continuous file handling system is a little too clumsy for me... But a bug is a bug and I hope to see a new version with it taken out soon. So be warned – if you are using the continuous processing method, it will probably do the same when using segmented memory for general use as well!

WHAT THE DOC ORDERED

Ron Hughes , wrote in recently, claiming an incompatibility between Disc Doctor and the ATPL ROM board.

"One of the ROMs I have in my machine is Disc Doctor, and consequently I have used most of the files prefixed with +,= or – to enable me to use the *MENU command to invoke menu commands.

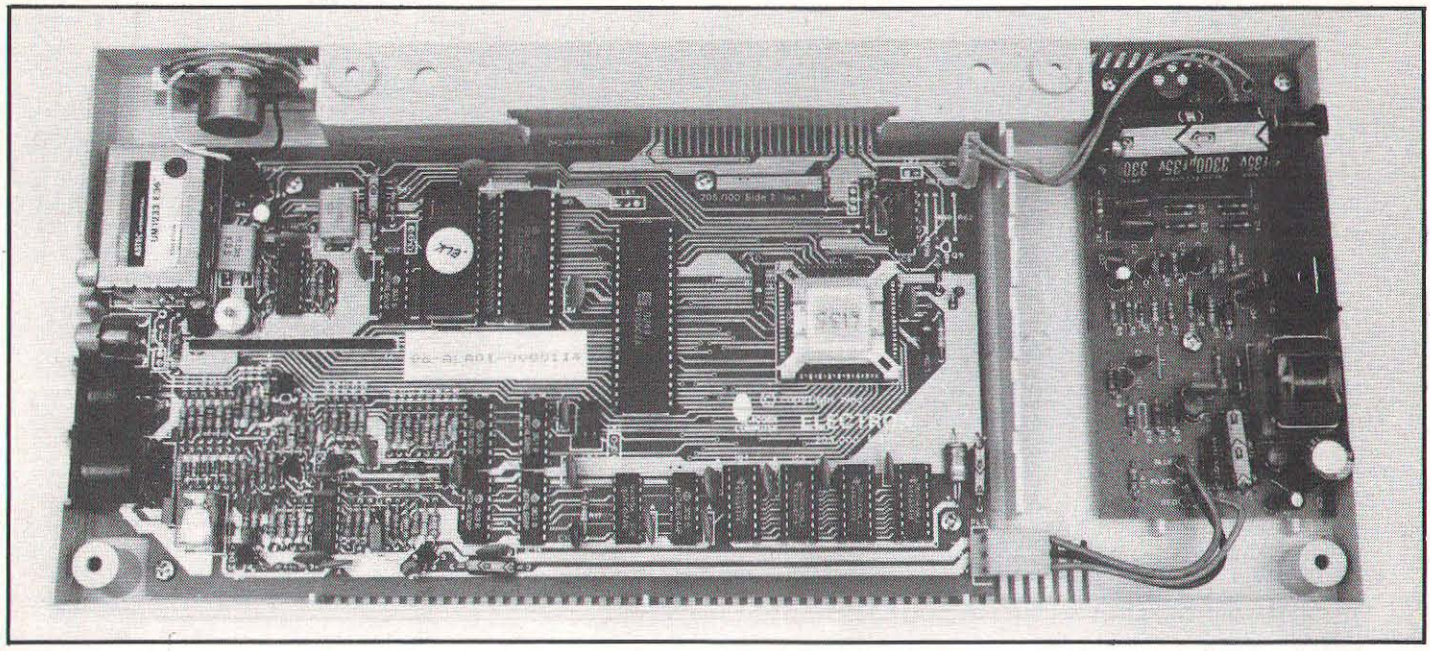
Since fitting the ATPL board, my programs will refuse to load every time, instead of CHAINing the program, it appears to load in the files (ie the disc lights turn on and the machine whirrs) and then just sits there, without doing anything else.

A colleague of mine has since bought an ATPL board and is experiencing exactly the same problems, surely this suggests some kind of incompatibility between Disc Doctor and the ROM board?"

It seems that you are right, Mr Hughes. Sidewise and Disc Doctor do not seem to work in certain ROM positions on the board, especially if it the highest socket on the board.

Try putting the chip in other sockets, as I have heard that this has had some success. Barring that, try putting the ROM in sideways RAM, apparently this selec-

CONTINUED OVER



tion works with the older ATPL boards.

TUBELINK

While we are on the subject of Disc Doctor, have any of you 6502 Tube users had problems, concerning the "Doc" chip and the 6502 second processors, or in fact, any Computer Concepts ROM?

After sending off my 6502 second processor and Beeb for repair after it had been playing up, it returned with a clean bill of health, but still persisted in scrolling endlessly with "—" characters. I decided to rip every ROM out of the Beeb (apart from BASIC, the MOS and the DNFS of course...) and surprise surprise, the second processor works fine. The fact is that Computer Concepts have been a little naughty where it concerns Acorn's guidelines for software compatibility. The poor people in Acorn's technical enquiries department must groan as yet another Computer Concepts ROM is released. The Computer Concepts "Graphics Extension" ROM has caused spectacular crashes when connected to a Tube, and is not even called in with a *FX162!

I wonder how spectacular the crashes would be on a BBC Plus?

MACHINE CODE BOOKS

A Finney of Staffordshire has, at last, outstripped the BBC BASIC ROM in his machine, and is looking for some books to read up on machine code. He would also like to know if Acorn supply a memory map, and if so, how he can obtain one.

There are some excellent books on machine code and learning machine code. The best 'beginners' book has to be *Assembly Language for the BBC Micro* by Ian Birnbaum (Macmillan) now in its third (or fourth?) year. Then there is the 'classic' 6502 Book, *Programming the 6502* by Rodney Zaks (Sybex). This is not very good as a learning manual, but when you start learning Machine Code, you will see how useful it is as a reference. Bruce Smith's *Assembly Language Routines for the BBC Micro* (Shiva Press) contains a wealth of useful routines and finally, get the *Advanced User Guide*, which (apart from including information that Acorn were afraid to give us in the *User Guide)* contains a very good memory map for the BBC.

MINUS THREE?

Mark Turner of North Humberside, is more than a little peevedat the lack of support that the Plus 3 has attracted. "I was at first highly pleased with it until I discovered the new ADFS was in fact a "downgrade" from the standard Acorn DFS. This is because, firstly the ADFS gives the Electron 3.75K less usable memory and moves the PAGE from &0E00 to &1D00, making it completely incompatible with the BBC DFS.

Secondly, as even less memory is free, no commercial software is able to run on the Electron and Plus 3. My games and business software are too big to be converted and need all of the Electron's valuable memory. To top it all, there is not one software company that will move its Electron software (games or business) up onto disc.

In a desperate bid, I wrote to Vine Micros, asking whether they would convert their Tape to Disc ROM from the Beeb to Electron. Their reply was that although other Plus 3 owners had written to them about this ROM, they would not convert their TtoD ROM because it could well be an "impractical investment" (quoted from their letter) so I am stuck with my Plus 3 to SAVE only my programs which aren't very many".

Hmmmm, this looks serious. The Plus 3 is by far the best add on for the Electron, if no one is going to support it, as you suggest, then you areleft "holding the baby".

Contacting Acornsoft, they did in fact remind me that their Database has been reconfigured and actually improved for the Electron Plus 3. They plan to do more in the future, but their recent problems have limited their attentions concerning support of their new Plus 3.

Micro Power are considering moving their best software packages onto the Electron, perhaps as a bundle. Some companies are also a little "snobby" about the Electron and associated products (nobody mentioned here) and consider it a machine riding on the success of the Beeb, but as you and I know, the Electron is a powerful machine in its own right and is by far the best machine in its price range. PS Mark, *A&B Computing* does not stand for "Acorn" and "BBC", but is a throwback to the days when there were model A and B machines for the BBC Micro.

THE QUICHE CHRONICLES

Taken from the very bowels of a mainframe computer in the rural

bliss of Hertfordshire, comes the computerised masterpiece I outlined inlast month's Feedback in the form of "Real programmers don't use PASCAL".

"Back in the good old days — the "Golden Era" of computers, it was easy to separate the men from the boys ("sometimes called "real men" and "quiche eaters" in popular literature). During this period, the real men were the ones that could understand computer programming, and the quiche eaters were the ones that didn't. A real computer programmer said things like **"DO 10 I=1,10"** and **"ABEND"** (they actually talked in capital letters, you understand), and the rest of the world said things like "computers are too complicated for me" and "I can't relate to computers — they're so impersonal". A previous work points out that real men don't "relate" to anything at all, and are not afraid of being impersonal.

But, as usual, time changes. We are faced today with a world in which little old ladies can get computers in their microwave ovens, 12 year old kids can blow real men out of the water playing Asteroids and Pacman, and anyone can buy and even understand their very own personal computer. The real programmer is in danger of becoming extinct, of being replaced by school students with TRASH-80's.

There is a clear need to point out the differences between the typical high school junior Pacman player and a Real Programmer. If this difference is made clear, it will give these kids something to aspire to. It will also help explain to the employers of Real Programmers why it would be a mistake to replace the real programmers on their staff with 12 year old Pacman players (at considerable salary savings)."

Next Month.. The language problem.

ARTIFICIAL LIFE

T D Wilson had a strange error message concerning "LIFE" in January's *A&B* : "LIFE could look to be interesting if I could get it to work. The problem is that I get an "at line" error message on the screen, after the frame and the headings. Any ideas what to do?"

When the error is an "at line xxxx" then the BASIC interpreter finds an error but it is not trapped with BASIC, ie, the problem lies with machine code, and that can be rather tricky. Thankfully, you only have to check for an error in lines 830 to 880, in the "clearfield" subroutine.

The problem could be that you have miskeyed the routine, or perhaps there is a problem with machine code space, some programs do not like being run on disc systems, even if they are very short.

PRETTY PRINTING PDQ

S H Boyd has issued a *HELP concerning his Kaga Taxan NLQ (near letter quality) printer. "I have purchased the KP810 model and have had no bother setting it up. Nor have I had any problems getting into print.... my real trouble is that I can only operate in the print modes available on power up, for instance the standard Pica and letter quality, I cannot access any of the other codes in BASIC or in View all to no avail. By the way, I have Beebug's Toolkit ROM fitted, could that be messing things up?"

Toolkit shouldn't be "messing things up", and certainly not in the way that would alter the printer codes in such a way as to only give you two print styles at one time. For View usage, the best thing you can do is buy the printer driver generator from Acornsoft. This will, by a series of question and answer sessions, deduce what sort of printer you have attached to your computer, and is easily configured for all sorts of printer.

For use in BASIC, the control codes should be set as standard, the manual should give all of the details. If the characters don't actually match up, then you can be sure that the DIP switches are not set up correctly. An approved Acorn service centre will probably know what to do in order to correct this. The dip switches are normally documented well,in case you should want to do it yourself... You may have a foreign typeface selected, so that printers can be limited to suit different needs and printer faces in other countries (like Sweden and Germany).

SILVER PLATED WORD POWER

John Chambers of Rhu, Dumbartonshire has been getting into using his Beeb as a word processor, his hardware is quite good and he is planning to go for the Scribe word processor package.

His word processing needs are quite large, book length pieces of text, probably divided into chapters, printing out on the Brother HR-15 daisywheel printer. "Depending on what else needs to go with it, I can probably just about afford the 128K Solidisk. What else is needed, to produce a set up that will work effectively as a Scribe/Solidisk package, comfortably flexible and responsive, but not gold plated?"

Your decision to consider the Solidisk DDFS is a good one, especially as you are using Scribe. Cutting out "the super hype", there are definite advantages in using Scribe and Solidisk together, the Solidisk 128K RAM system is very good, and, to be honest, the Watford 32K RAM system will be of great use, even if you only use it as a printer buffer.

A DDFS will better for you than an Acorn DFS especially as DDFS' performance is often faster than Single Density DFS operation.

If you want the convenience of having large quantities of memory available, then perhaps a look at the 6502 second processor will also be of some use. The speed advantages are phenomenal, and editing files and text is very much faster than in single processor mode.

NEW GAMES ON THE HORIZON?

Rumour has it that there is a new Castle Quest-type game about to hit the games shelves. Although the details are rather sketchy at the moment, the general location is a "dungeons and dragons" scenario, with Bats and Grabbers, Lasers and Serpents — not to mention some rather nice animated characters of the high quality that we have come to expect, considering the standards set by Castle Quest.

Called "Devil's Domain", the game has a number of "Satanic connections" that are linked with the clues.... I can't wait to see what it's like.

The other rumour is that there are plans to make a mega version of Castle Quest which vastly expands the original, and has much more to offer, with different clues and solutions as well!! Consider it a bit like the Tube version of Elite, with all the trimmings. The future for Castle Questors certainly looks good.

ALLEGRO FINALE

The response to my Music 500 cassette has been phenomenal, thanks for all the comments and suggestions.

D K Memmen , of Glasgow asks: "Will you be publishing some AMPLE programs in the near future...on the strength of your tape offer, I purchased a Music 500 and apart from the manual, I am very happy with the sounds it can produce. Any chance of other Beeb music synths?

The good news, for anybody musically inclined, or those of you who have decided to take up the Music 500 offer (now in the Software Sale section) is that we will continue to support Music 500. There are some really useful utilities and projects in the pipeline, so keep an eye open.

And yes, I will be looking at other Beeb related synths.

Well that's about all I can squeeze in for the moment, so in the meantime, keep those letters rolling in, and I'll try to get through as many as possible. Write to me at

Feedback
A&B Computing
1 Golden Square
London W1R 3AB

Plustalk

Jonathan Evans

Interactive Programming in Wordwise Plus for the preparation and presentation of instructional material.

When I received my Wordwise Plus upgrade I was immediately struck by the power of the command language which Computer Concepts have incorporated into the chip. It is noticeable that the supplied utilities perform complex functions (eg indexing) with remarkably short listings. The reason is that while superficially similar to BASIC, the language is really of a higher level since it can control complex operations of the word-processor with single commands (eg PREVIEW FILE "name"). Another delight about programming in Wordwise Plus is that you write the programs using the word-processor itself making editing and formatting of listings delightfully simple in comparison with BASIC.

There is a very interesting feature of the language which is not exploited in the supplied programs, namely the ability to write interactive programs. The language allows you to print text on screen for the benefit of the user and to accept input from the keyboard. The obvious application of this facility is to prompt users about editing functions, eg a multiple copy program can prompt for filename and number of copies required before printing.

It occurred to me, however, that these facilities could be employed for a purpose not normally associated with a wordprocessing program – the design of instructional material to be presented on screen. With the BBC computer being so commonly used in educational establishments there is often need to present pages of text and it is very tedious indeed to achieve by sequences of PRINT statements in BASIC.

The programs presented here display text pages on screen with both serial and random (menu) access, but require the presence of a disc system as well as the Wordwise Plus chip to run.

With the old Wordwise it was possible to write passages of text with line width appropriate to the screen mode, spool the file and *TYPE it off disc in a BASIC program. The only practical method, however, involved presenting a continuous passage of text in paging mode, rather than distinct screen pages. My first program, SEQREAD, (listing 1) gives a routine in Wordwise Plus that presents sequential screen pages where the subject is prompted to press the space bar to see each page in turn on a cleared screen.

CREATING DOCUMENTS

In order to use the program, you must first write your text in the following way. Enable paging, and since the text will be presented in Mode 7, set line length to 39 and page length to 23. The spare lines at the bottom are used by the program to print the spacebar prompt. Since the default top and bottom space in Wordwise are designed for the much larger 66 line printed page they should be reduced using the TS and BS embedded commands. Remember to end your file with the three characters ‹f1›BP so that it will spool to an exact number of pages.

Since presentation will be sequential you do not need to take up space with page numbers printed in the footing, as in the default settings. You cannot use double height or colour, but you can of course take advantage of text formatting such as centered headings and right justification. You can also utilise the line numbering facility on preview in Wordwise Plus to help design your screen pages. When you are satisfied, create a spooled file using menu option 8 for use with SEQREAD. The program can be loaded into any segment.

When SEQREAD is run, it asks you to enter the name of the spooled file. There is a short pause while it opens your file to work out the number of pages it contains and then the first page appears on screen. When all pages have been viewed, an option for repeat viewing is offered. While SEQREAD improves considerably on the use of BASIC or the old *TYPE method, it does not utilise the power of Wordwise Plus fully. It is, in fact, possible to present a menu with the starting page of each section of text and allow the user to enter the page number at which he or she wishes to start reading. This is achieved by the programs INDREAD and RANREAD shown as listings 2 and 3 respectively.

To use these programs, first prepare your text as a spooled file with the same dimensions as for SEQREAD (line length 39, page length 23). In this case it is sensible to include page numbering. The text should *not* include the menu page itself. Then load INDREAD (listing 2) into any segment and place a disc with the spooled file in the drive. When run, the program will create an index file to record the number of bytes taken up by each line of the spooled text. To run the main program, RANREAD (listing 3) you must have both the spooled text and the index file present on the selected disc drive. RANREAD must also be edited slightly, to specify the number of pages in your text file, and to enter the names of the text and index files. The only other task is to insert PRINT commands at the point indicated in the REMs to display the menu for your particular application, so that the user will know the starting page of each section.

Using these programs it is possible to prepare on-screen instructional material in a fraction of the time taken to write it in BASIC or using a teletext page design system (though the latter will permit use of colour etc). The text can be as big as memory capacity will permit, since no programs need to be loaded into segments whilst it is being written, and the programs read the text from files on the disc without loading it into memory. In addition to providing a most useful application of Wordwise Plus, I hope that this article has also shown the potential of the language for interactive programming and will stimulate readers to produce their own applications.

PROGRAM LISTING 1

```
REM SEQREAD

REM Program to read spooled file and
REM present screen pages in sequence.
REM Requires file created with line
REM length 39 and page length 23.

REM Jonathan Evans, March 1985

CLS
PRINT
PRINT"PROGRAM TO PRESENT STORED PAGES"
PRINT"IN SEQUENCE."
PRINT
PRINT"PLEASE ENTER NAME OF FILE ";
G$=GLK$
G%=OPENIN(G$)
```

```
REM Count number of pages in file
REM L% - number of lines in file
REM P% - number of pages in file

L%=0
REPEAT
  L$=GLF$G%
  L%=L%+1
UNTIL EOF#G%
P%=L%DIV23
PROCcontinue

REM Print pages


REPEAT
  PTR#G%=0
  N%=0

  REPEAT
    N%=N%+1
    CLS
    DOTHIS
    L$=GLF$G%
    PRINT L$
    TIMES 23
    PROCcontinue
  UNTIL N%=P%

  CLS
  PRINT

REM Offer option of repeat

  PRINT"Do you wish to see the pages again?"
  PRINT"Type Y or N ";
  REPEAT
    G$=GCK$
  UNTIL G$="Y" OR G$="N"

UNTIL G$="N"
END

.continue
VDU31,0,23
PRINT "Press SPACEBAR to continue."
*FX15,1
REPEAT
UNTIL GET=32
ENDPROC
```

PROGRAM LISTING 2

```
REM INDREAD

REM Program to read spooled file and
REM create index file to permit random
REM access to stored pages by RANREAD

REM Jonathan Evans, March 1985

CLS
PRINT
PRINT"PROGRAM TO CREATE INDEX FILE FOR"
PRINT"RANDOM ACCESS TO STORED PAGES"
PRINT"IN SPOOLED TEXT FILE."
PRINT
PRINT"Enter name of spooled file ";
S$=GLK$
PRINT
PRINT"Enter name of index file ";
I$=GLK$
S%=OPENIN(S$)
I%=OPENOUT(I$)

REM Count number of bytes in each
REM line and save in the index file
REM C% has byte count for each page

I$=GLK$
S%=OPENIN(S$)
I%=OPENOUT(I$)

REM Count number of bytes in each
REM line and save in the index file
REM C% has byte count for each page


REPEAT
  L$=GLF$S%
  BPUT#I%,LEN(L$)+1
UNTIL EOF#S%

CLOSE#0
END
```

PROGRAM LISTING 3

```
REM RANREAD

REM Program to read spooled file and
REM present screen pages by random access.
REM Requires file created with line
REM length 39 and page length 23
REM and index file.

REM Jonathan Evans, March 1985
```

CONTINUED OVER

```
REM S$ - spooled file, I$ - index file

S$="S.TESTR"
I$="I.TESTR"
S%=OPENIN(S$)
I%=OPENIN(I$)

REM L% - number of lines per page
REM P% - number of pages in file

L%=23
P%=9

REPEAT

REM Present menu
REM Insert PRINT commands for your menu
REM after the CLS command.

  CLS
  PRINT
  PRINT "CHOOSE STARTING PAGE 1 TO ";
  PRINT P%
  PRINT "OR ENTER Ø TO QUIT PROGRAM"
  PRINT
  REPEAT
    PRINT"ENTER CHOICE: ";
    C%=VAL(GLK$)
  UNTIL C%>=Ø AND C%<=P%

  IF C%=Ø THEN GOTO end

REM Display pages

  PROCsetpointer
  C%=C%-1
  REPEAT
    CLS
    DOTHIS
    L$=GLF$S%
    PRINT L$
    TIMES L%
    C%=C%+1
    PROCcontinue
  UNTIL G%=13 OR C%=P%

UNTIL FALSE

.continue
VDU31,Ø,23
PRINT "SPACEBAR - next page   RETURN -
menu." *FX15,1
REPEAT
G%=GET
UNTIL G%=32 OR G%=13
ENDPROC

.setpointer
IF C%=1 THEN GOTO page1
PTR#I%=Ø
B%=Ø
K%=1
REPEAT
  DOTHIS
  B%=B%+BGET#I%
  TIMES L%
  K%=K%+1
UNTIL K%=C%
PTR#S%=B%
ENDPROC

.page1
PTR#S%=Ø
ENDPROC

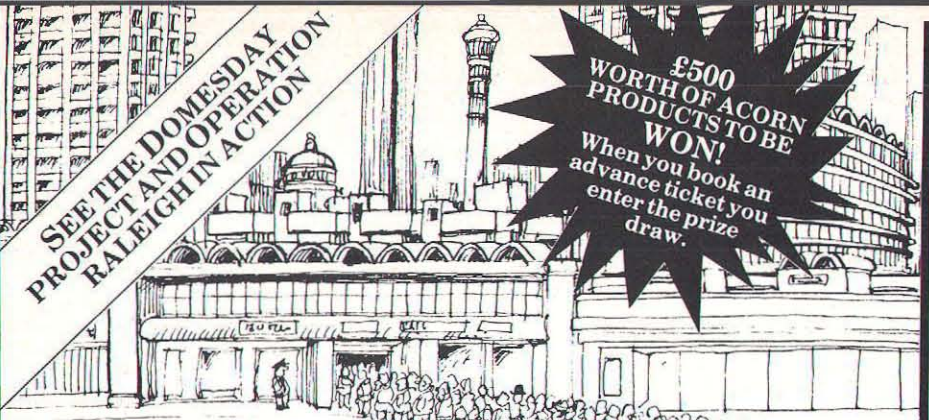
.end
CLOSE#Ø
END
```

```
WORDWISE-PLUS
(C) Computer Concepts 1984

 1)   Save entire text
 2)   Load new text
 3)   Save marked text
 4)   Load text to cursor
 5)   Search and Replace
 6)   Print text
 7)   Preview text
 8)   Spool text
 9)   Segment menu

 ESC Edit Mode

Please enter choice
```



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For information on stand availability ring Tim Collins on 01-930 1612

P.S. Acorn have promised some very special events exclusive to the show!

Quinkey Business

Jon Vogler

Quinkey brings hope for non- typists

"The problem is, to use a computer you need to be able to type. I can only tap away with one finger."

How often have I heard this from high-powered businessmen and women, whose giddy teenagers can churn out 40 words per minute on a typewriter but who, themselves, have been so pampered with secretaries and typing pools, they have never acquired the skill.

Straight word processing is simple, you dictate it just as with typing. When you use it in combination with a database of names and addresses or products however, it becomes too complicated for a scribe without special training. Other business computing is even worse: some secretaries run a mile if they see more than three figures in a row, so financial reports scare them stiff and as for columns of budget data in a spread sheet..... Help!

The executive, faced with the dubious task of doing it for him/herself, is soon baffled by the illogicality of the QWERTY keyboard. Why do 'A' and 'Z' sit together? Why is 'Q' six spaces away from the 'U' that always follows it? Many give up trying to type fast: and all the computer's potential to improve their productivity is wasted.

Now a totally new concept has been introduced: a keyboard for the BBC Micro without the usual forty keys, but with only six. The alphabet and numbers are produced by pressing combinations of the five main keys — rather like playing simple chords on a piano. A sixth key is brought into play for editing, formatting, and all BBC control functions. Operated with one hand, text is written straight into the computer's memory. This is the Quinkey.

HOW QUINKEY WORKS

The Quinkey is a moulded plastic shell, with a mains lead and a cable that plugs into the "analogue port" at the back of the BBC computer. Switch on, load the accompanying software, and any kind of entry, such as word processing and programming, can be made with either the BBC's own keyboard or with the simple Quinkey keys. These are not arranged in a regular pattern, but are positioned to suit the size and shape of the average hand. Every letter and character can be obtained by some combination of the five and it is reported that most people can learn these in a couple of hours. The learning process is made easier by some clever visual images: different permutations of the five keys are imagined as taking up the shapes of the letters they represent. As each fingertip on the operating hand is 'dedicated' to only one key there is no need to look at what is being written — touch typing is automatically achieved.

The sixth, "command" key has a wide range of functions: if pressed once the next letter only will be in upper case. Pressed twice, the keyboard locks into upper case until cancelled by pressing the command and thumb key together. A similar arrangement is used to produce numbers and yet a further set of combinations offers commands such as RETURN, DELETE, COPY, REPEAT, TAB, ESCAPE and so on. Special symbols, such as brackets and dashes, use a command key followed by a letter.

A further, rather complicated, list of combinations, performs various sequences and activities which, on a normal computer or word processor, require only a single keystroke. For example, to move the cursor one word to the right needs: COMMAND KEY with H, followed by a number 2, followed by COMMAND KEY with F: far too lengthy a sequence to permit rapid editing.

Up to four Quinkey units can be linked simultaneously to one BBC computer. This was designed for education: four children can work together (or squabble together) on one Beeb, but it would not be difficult to think of using it in business conferences and those terrible training sessions where they say: "You are going to split up into groups and produce a report on ....."

QUINKEY WITH BUSINESS SOFTWARE

Quinkey is compatible with the standard Acorn facilities such as the BASIC 1.2 operating system and 0.90 DFS (disc controller). You can therefore use it for writing your own BASIC programs. Unfortunately, for running commercial programs, even if they are written in BASIC, the utility program required is itself one and a half thousand characters in length (although half this can be "relocated"). Therefore a program which uses all the BBC's memory would not be compatible with using Quinkey. As commercial programrs tend to squeeze in everything they can, try to add extra features until the last byte of memory has been consumed, this is likely to be a problem. I tried loading a business program (Gemini's Payroll), using the "PROG" utility program provided by Quinkey for this purpose, but was unsuccessful. A procedure is provided, for merging PROG with a BASIC program. This is complex but very clearly explained, but as my business program was in machine code this also was not effective. Even if it had been written in BASIC, the amount of work involved, in merging the seven or eight different modules in a business package, would be excessive and the risks of error too high for any but computer maniacs.

However, it is in wordprocessing that keyboard colleywobbles are the worst handicap and this is where Quinkey works best. There is a utility program called "WP" for use with *Wordwise* and *View*; however it can only use a single keyboard.

COST AND ASSESSMENT

The Quinkey basic pack, comprising interface for the BBC, keyboard and two software packages for word processing and programming, plus comprehensive instructions, retails at £49.95. Each additional keyboard costs £29.95. The keyboard measures 230mm x 117mm x 50mm and weighs only 735 gramms, so it can sit conveniently on top of a disc drive. Quinkey is sold by Microwriter Limited, 31 Southampton Row, London WC1. Microwriter takes its name from the tiny word processor they sell. This does not need a computer to go with it. Housed in the same shell as the Quinkey, it is a micro computer with a tiny display but full reviewing, editing, inserting and deleting facilities, a menu for comprehensive communications and formatting facilities and a memory of 8K (eight thousand characters: about two thirds the length of this article). It costs £399 plus VAT and there are briefcase-size printers to go with it: a handy combination for travelling businessmen and salesmen.

Quinkey is comparatively cheap, is small, light in weight, simple in concept and its possibilities seem considerable. Most of the revolutionary developments in computing have been associated with electronics. Quinkey is a piece of radical "ergonomic" design which many non-typists might find very useful indeed. Its strength lies in word processing, employing a limited range of commonly used, and therefore quickly learned, key combinations. Even if not a great writer of lengthy reports, any non-typist who handles correspondence could achieve substantial improvements in personal productivity and speed of service.

It would be particularly valuable for those operations where one wants to record information with one hand while using the other for controlling laboratory equipment or other machinery. It was not envisaged for general business computing and is not suitable for this purpose. However, I would encourage the manufacturers of this most imaginative device to develop their technology further and bring out a Quinkey keyboard that can be used with a wide range of business programs.

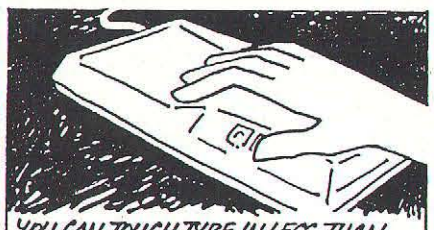
IS KEYBOARDING TURNING YOU INTO A 'MICRO MONSTER'?

Let's face it, your BBC Micro is a demanding creature. Powerful it may be, but using the keyboard is probably a lot harder on *YOUR* system than you expected — and it's all because you're forced to 'hunt and peck' amongst 74 keys, on a keyboard that's a hundred years old!

It's no wonder you feel like the many-headed hydra! With your eyes being torn from document to keyboard, then to the screen for checking, and back again. Errors and bugs are bound to creep in.

Master your BBC Micro overnight with QUINKEY.

QUINKEY REPLACES EVERY CHARACTER, COMMAND AND FUNCTION ON YOUR BBC (EXCEPT BREAK), AND SIMPLY PLUGS INTO THE ANALOGUE PORT AT THE BACK.



YOU CAN TOUCH TYPE IN LESS THAN ONE HOUR WITH QUINKEY'S SIX KEYS, USING THE FAMOUS MICROWRITER TECHNIQUE PROVEN BY THOUSANDS OF USERS.

YOU ONLY NEED ONE HAND TO USE QUINKEY—AND THE LONG LEAD ALLOWS YOU TO SIT BACK, RELAX AND CONCENTRATE ON WHAT'S REALLY IMPORTANT—YOUR WORK.

ACCURACY AND SPEED COME NATURALLY BECAUSE YOU'RE TOUCH TYPING YOU CAN DEVOTE ALL YOUR CONCENTRATION TO READING ACCURATELY FROM THE SCREEN OR DOCUMENT.

AND, FOR THOSE LONG LISTINGS, QUINKEY REALLY IS A MUST. BECAUSE YOU NEED ONLY ONE HAND, THE OTHER IS FREE TO FOLLOW DATA.

WHAT YOU GET FOR £49.95

1 QUINKEY KEYBOARD

Five keys (plus control key) pressed in easily remembered combinations, give all inputs except Break. Can be used in conjunction with BBC keyboard or as entire replacement.

2 QUINKEY INTERFACE

Four-channel connector for up to four Quinkeys.*

3 SELF-TEACH GUIDE

Contains everything you need to know. Instantly learned, simple mnemonics based on widely used technique of Microwriting ensure you're touch-typing in under an hour.

4 PROG & WP SOFTWARE

Supplied on cassette (User Guide shows how to transfer to disk).

PROG merges easily with applications programs. WP enables Quinkey to be used with word processing packages such as Wordwise, View and Edword.

TECH SPEC — When invoked using CHAIN "WP" or CHAIN "PROG", loads at the current PAGE value and moves PAGE up by 768 bytes. No zero-page locations required. Interrupt service vector IRQ2V, correctly chained.

TESTED COMPATIBILITY — BBC model "B" OS E.I BASIC I or BASIC II (except when using INKEY with negative argument), DFS 0.90. View A1.4, Wordwise 1.17, Edword.

Microwriter Ltd.,
2 Wandle Way, Willow Lane,
Mitcham, Surrey CR4 4NA.
Tel: 01-685 0300

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*Tick box ☐ More information about the educational pack of 4 Quinkeys and software for schools.

I enclose a cheque made payable to "Microwriter Ltd" for £.....
or debit my Visa/Access credit card No. .....

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Please allow up to 28 days for delivery. Reg. No. 1374069

YC8

Software Reviews

Title Brian Jack's Superstar Challenge
Publisher Martech
Machine Model B/Electron
Price £6.95

This game dashed straight into both the Electron and BBC charts as soon as it was released. Once again a television spin off, made even more attractive by the sporting associations, hit the jackpot.

The unfortunate thing about both versions of this group of games is that the graphics and sound does not really compete with standards being set elsewhere. At the same time there is no denying the clever way in which a number of games have been squeezed into memory and the excellence of the original idea.

Making sport appear realistic on the BBC or Electron is asking too much. A racing car cockpit is about the best you can hope for. Football Manager does a creditable job with the playing side of the game and ski slopes are not too difficult. Swimming, canoeing, running, gym exercises, shooting and so on do not really lend themselves to the micro screen.

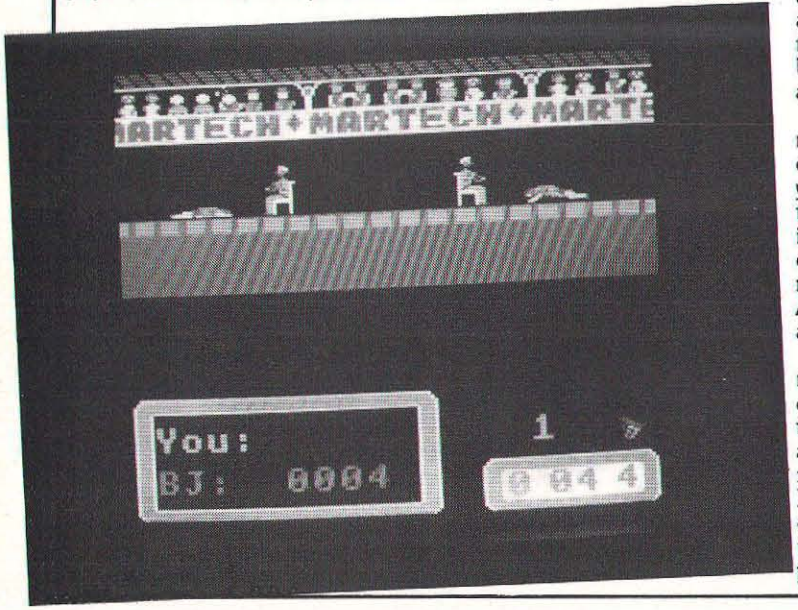
The format chosen for the competition at these sports is simple. Brian Jacks goes first and does very well. The player follows and tries to match or beat his performance. Since the sports are physical, the player has to actually carry out physical work with the keyboard or joystick to complete the course. There is also some skill element in judging the shooting, or keeping the canoe on course or steering the football around the posts.

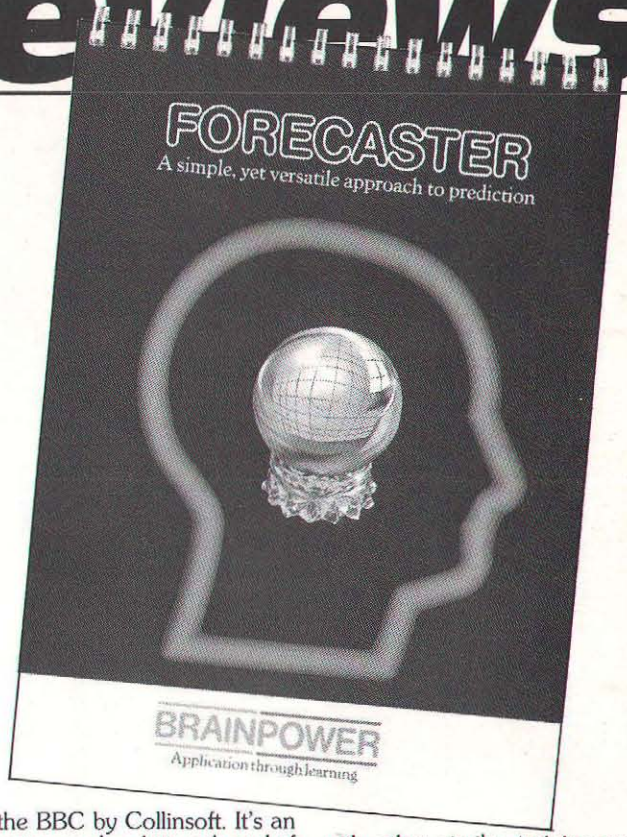
So, the sports are well thought out, the player's goals defined, but where's the fun? The action on screen is not up to reflecting the enthusiasm of the player to take on the sport. Each race against the clock is very much like the last one and interest soon wanes.

The graphics throughout the game are dull and slow. There is some use of sound and an interesting use of speech (Acorn speech upgrade) for starting the races, counting the sit-ups and reporting the scores.

Ratings table

SOUND	60%
GRAPHICS	50%
DOCUMENTATION	65%
VALUE FOR MONEY	65%
OVERALL	60%





Title Forecaster
Publisher Collinsoft
Machine Model B
Price £19.95 cassette, £24.95 disc.

Forecaster is one in a series of serious tutorial software written by Tryptych software for a number of home computers and marketed for the BBC by Collinsoft. It's an interesting and ambitious brand of software. It takes a complex and specialist subject and makes use of some very well written and presented tutorial in conjunction with demonstration and self-test software. It's a sort of Teach Yourself pack. What you get at the end of the day, in theory, is a set of programs which can be used to forecast, let's say, future sales results, and, if you have completed the tutorial, the knowledge to get the best from the programs and the ability to interpret the results.

The links between the written material and software are well designed but there's no problem if you wish to take the manual away to read it. The software at this stage is mainly reinforcing the message, demonstrating the mathematics of regression, of Time Series, Moving Averages, Exponential smoothing and Holt's method.

The programs themselves are no great shakes in the display department but I suppose much of the code is devoted to the calculations involved. It is interesting to note however that no real attempt has been made to make good use of the BBC's graphics despite the use of disc based software in this package. This can be contrasted with other similar training packages originated on the BBC.

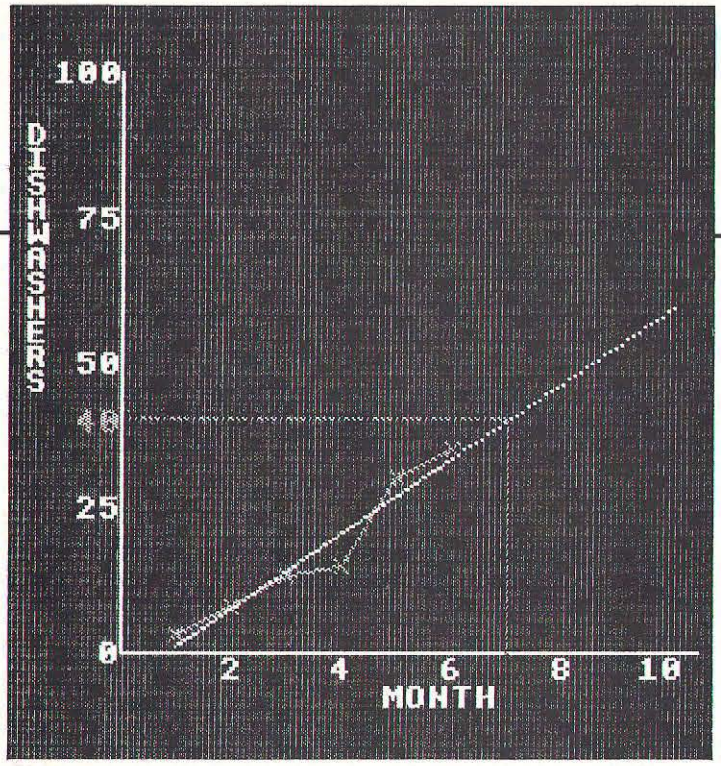
Because the BBC is the micro for education and training, there are a number of similar aboriginal packages available which cover the ground more comprehensively. However for the individual wishing to tackle this subject for study or for background on the forecasting techniques used for business, Forecaster is a very clearly presented introduction and there is no chance of you getting lost in a mass of incomprehensible equations. It's not exactly what I would call a hobby but if the bug gets you, Forecaster will provide the means of learning.

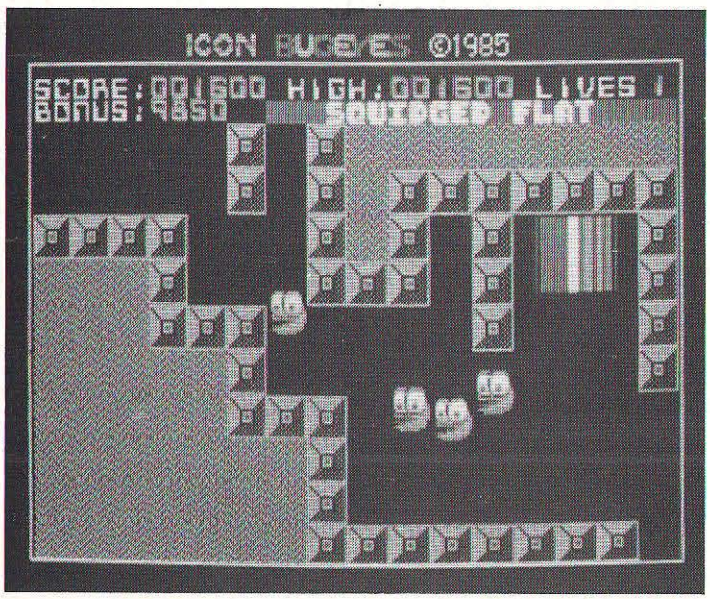
Ratings table

GRAPHICS	**60%**
DOCUMENTATION	**90%**
VALUE FOR MONEY	**75%**
OVERALL	**75%**

Title Tempest
Publisher Superior
Machine Model B
Price £7.95

Great to find a top notch arcade shoot'em down game amidst the hordes of arcade-adventures now





appearing. The "Copyright Atari" message rightly confirms the coin-op pedigree of Tempest.

The simplicity of controls, left and right around the sections of various three dimensional frames and super fast auto repeat fire, mean that all you have to do is sit back and blast away. Well not quite all.

Initially only armed with three ships, you can't afford a break in concentration which will let the incoming attackers build up dangerous concentrations or catch you unawares with some return fire.

Tempest rapidly whisks you through a succession of screens, each with a differently angled and segmented three dimensional polygon. The attackers come out at you from the centre of a hexagon or from the remote edge of a rectangular bowling alley shape. Some split off into less predictable movement patterns when hit.

In the meantime you are scanning the targets, breaking up groupings which look menacing, trying to choose the shortest way around the segments of a shape to a trouble spot. There's only a limited time on some screens and if you clear up there are bonus ships to be won.

All this is going on amidst a barrage of some of the best SFX heard in a BBC game. I think the word will get around about Tempest and there will be some high scores to go after in the coming months.

Ratings table

SOUNDS	90%
GRAPHICS	85%
DOCUMENTATION	70%
VALUE FOR MONEY	80%
OVERALL	80%

Title	**Bug Eyes**
Publisher	**Ikon**
Machine	**Model B**
Price	**£7.95**

Bug Eyes is another very well executed platform type game with a variety of floating nasties, pumping machinery and less than solid flooring to catch you out as you try to complete the screens.

Timing, subtle key manipulation and patience are prime requisites for a game like this, and with plenty of the latter you will eventually win through.

The sprite movements in Bug Eyes are very smooth and the graphics in general pleasing to the eye. The sound effects are less inspired, boring even.

The scenario brings you, agent Starman, to the ten levels of the star ship/meteorite of the Xxebaneans. They are out to destroy earth and all intelligent life on it so you have to make your way to the generator room to put a stop to all this nastiness.

As you make your way through each screen trying to avoid the Stampy Stompers and other notorious bugs a bonus score counts down. So as you improve your performance and catch on to the correct routes through the screens your bonuses go up. There is also the temptation to push it just too far.

No complaints about the programming then, nice 3D text and computer character sets and the stars scrolling behind the instructions on the opening page are very nice. Just a bit lacking in that extra flair which usually characterises Icon games. Perhaps watch out for Contraption and Flip! in the next months issue.

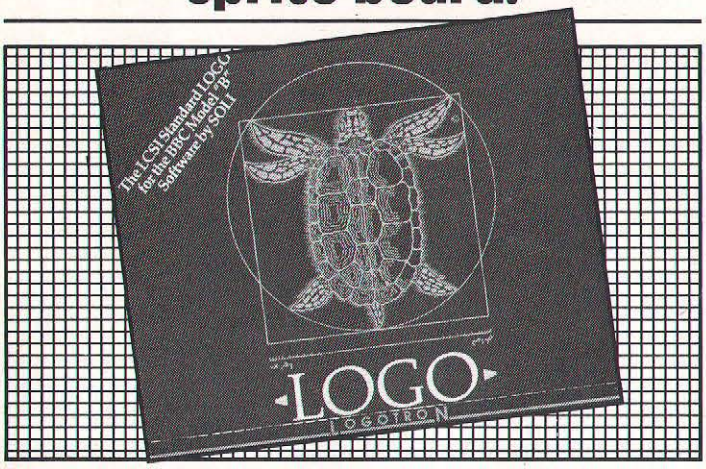
Ratings table

SOUND	40%
GRAPHICS	80%
DOCUMENTATION	80%
VALUE FOR MONEY	80%
OVERALL	75%

Making the most of Logo

Ann Owen

News of version 1.2 of LSL Logo and the Logotron sprite board.



We talked last month about some of Logo interaction with the BBC filing systems. LSL's new extensions help greatly. We have also discussed the lack of a redefineable turtle in the 16K Logos. The Logotron sprite board should prove a very interesting and powerful answer.

Logotron have in fact encountered some problems with their SAVE primitive when trying to save to cassette or on Econet Fileserver. Two small procedures are listed as figures one and two which deal with, respectively, saving entire workspace and named procedures or global variables. Thanks to Logotron for this information.

There is certainly an argument in favour of cassette based systems going for a more comprehensive version of the language held in ROM, thus avoiding the administration of large numbers of Logo files stored serially on cassette.

Both 16K Logos still manage a considerable range of primitives, the built-in procedures of a Logo implementation, well over 100 in each. Logotron decided not to include extended name versions of primitives eg READLIST for RL. It is very easy for teachers or parents to define suitable long names, for instance: **TO READLIST RL END.**

LSL supports longer primitives in line with its general policy of making the language easily accessible to younger users of the language. Both versions contain an adequate number of primitives dealing with arithmetic, COS, SIN, TAN, SQRT (in Logotron) ATAN (in LSL) etc. The all important addition, subtraction, division and multiplication bring us to a point of policy.

Logotron Logo supports both Infix and Prefix notation, in other words both 3 + 4 and ADD 3 4, both 3 * 4 and PROD 3 4. A prefix primitive like EQUAL? can act as the equivalent of = or as a logical operation, returning a TRUE or FALSE value depending on whether the inputs add up.

LSL version 1.00 insists on the use of Prefix notation and its use extends to primitives like GREATER and LESS, BOTH and EITHER and NOT.

EDITING

Logotron Logo follows the standard for editors and is very easy to use, the best of all the four available. You can define procedures outside the editor with TO...END but the editor is usually where most of the development work for a program goes on. It's a full screen editor, the cursor keys shooting you around the program. Insert mode is standard, wordprocessor style. The function keys are utilised for more specialised functions, like deleting a line and saving it into a "kill" buffer — a straightforward way of repeating oft used lines. You can scroll around large programs, and centre the text you are working on. And then there is the Find and Replace facility, an invaluable option and one which has found its way into BASIC extensions recently. CTRL/C changes your workspace according to your changes in the editor, Escape aborts without changing definitions.

LSL's editor is non-standard. You cannot define procedures from outside. It is not a full screen editor and has more in common with the way BASIC is edited on the BBC. The procedures are listed and the relevant line copied to the bottom of the screen for editing.

A new version of LSL Logo is now available which overcomes many of the criticisms raised. Among the new features is the ability to use TO and END to define procedure.

LSL LOGO V.1.2

Further improvements include a MAKELIST primitive which enables the programmer to create lists with dynamically evaluated elements (variables). Also included is a SEntence primitive.

LSL have also published a set of ten benchmarks and their results to support claims of superior speed and efficient use of workspace. The comparisons are with nearest rival (on speed) Logotron Logo. The benchmarks vary from simple screen output to the dreaded Fibonacci number series test.

Logotron is proved faster at graphics drawing but more complex recursion is handled better by LSL. LSL also affirm that their Logo takes longer to fill up workspace when asked to do so with a Sieve procedure. It shows especially good performance with a second processor in tow.

Three of the relevant procedures are listed here. LSL will supply a benchmark disc to interested parties. It's quite exciting for a race between turtles, isn't it?

A new LSL utilities disc is also now available. It contains machine code extensions to drive the Valiant and Jessop (serial) turtles and a printer screen dump. There are also commands to package procedures into single files — essential and most welcome.

A maths toolkit include various mathematical functions and the CALC command which allows infix arithmetic (see above). A list processing toolkit includes property lists and an interfacing kit provides PEEK and POKE and "bitwise" logical functions.

Also available is Control Logo which provides simple commands for communicating with hardware such as robots and buffer boards attached through the user port or 1Mhz bus.

All the extensions are available for version 1.2 and a free upgrade to 1.2 will be supplied with orders for extensions. You can get in touch with LSL on their hotline, 0454 313 076 or write to LSL, 316a Richmond Road, Twickenham TW1 2PD.

SPRITES BOARD

The Logotron sprite board is about to open up the possibilities of Logo and attract more users to the language for access to hardware animation. The board plugs into the 1Mhz bus and controls the video output of the micro, thereby freeing 20K of RAM.

The board provides up to 32 hard sprites to be controlled simultaneously or independently, 56 sprite shapes, 16 colours, shade facilities and collision detection.

The attraction of easy animation and arcade game writing may well prove to be an even more popular entrance into Logo than the turtle graphics. The retail price of the sprite board bundled with Logotron Logo is £239.95. Available to educational establishments for £175 plus VAT. The board alone is available to educational users for £130 plus VAT. Information from Logotron, Ryman House, 59 Markham Street, London SW3 4ND. 01 352 1088.

Down to Business

Jon Vogler

Upgrade your BBC Micro to an IBM PC.

The Graduate is the ultimate in "add-on" hardware. It will convert your BBC Micro into the nearest one can get to an IBM PC (Personal Computer) without infringing the IBM copyright. "Why do I want an IBM PC?" you may ask. The answer is very simple: there is more good business software available for the IBM PC than for any other personal computer including: concurrent (holds several programs in memory at the same time), multi-tasking (does more than one activity at the same time)and windowing (presents more than one activity on the screen at one time) operating systems, and such trendy business packages as *Symphony, Framework, Lotus 1-2-3, Perfect II,* and *DBASE III.*

Acorn, Torch (who make the Graduate) and Upgrade all offer Z80 add-ons to run the "CP/M" operating system but this can have only 64K of memory, which cannot be increased. With an IPM PC or a "PC compatible" computer you can have up to 640K of memory.

NOTE FOR THE TECHNICALLY MINDED

Z80 memory is limited to 64K, because it is an 8-bit processor with a 16-bit "address bus", giving 16 address channels which can address 216 or just over 64,000 different memory addresses. The IBM PC on the other hand uses a 16-bit processor, the 8088, which uses a 20-bit address bus to address up to 220 or just over a million memory addresses. IBM, however, do not physically provide that many.

There are other powerful upgrades around: Torch also make the Unicorn, a "third processor" of enormous power (which this column will review shortly) which can have up to a megabyte of memory, but (and I apologise to readers for the error on page 73 of the March issue which said it could) it *cannot* run the "MS-DOS" operating system. This is the widely available equivalent to "PC-DOS", which only the IBM PC uses and, at present, is the first choice of operating system for the best business software.

The Graduate has an 8088 processor, runs MS-DOS and has 256K of memory plus two "hardware expansion slots" so you can add memory until you have the full 640K: that is about three hundred pages of closely typed A4 text or the entire accounts for a fair sized company for a whole year! It can run virtually any program needed by the serious business user. I used it with *Lotus 1-2-3; Wordstar* and with the elegant new *Perfect Software II* (greatly improved and friendlier version of the software that is bundled with the Torch Z80) currently only available for the PC. I also, of course, used it with the Psion *Xchange* suite of integrated software, that is bundled with the Graduate and which is discussed below.

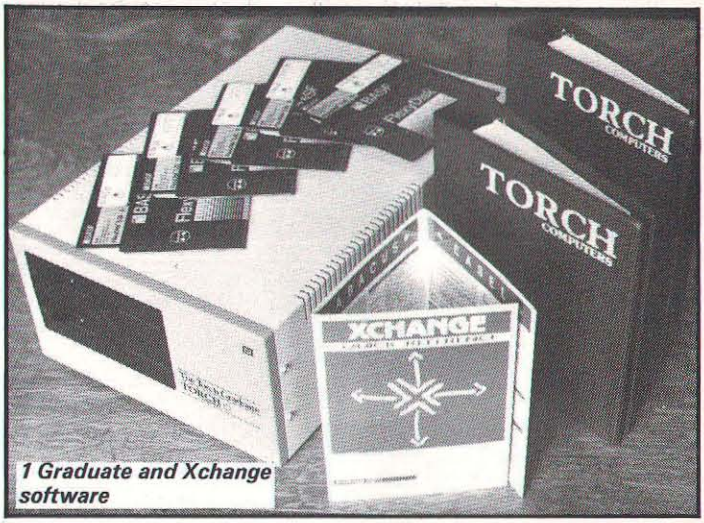
GRADUATE AND THE IBM PC

The Graduate is *not* a PC and those who buy it will want to know what shortfall they can expect. There are three main limitations.

Firstly, the modest restrictions imposed by using a BBC keyboard are overcome, by combinations of Shift and Control with character keys, and cause little problem.

Secondly, the BBC Micro provides only black and white in 80-column screen mode: far short of the IBM PC's impressive 16 colours. (Even though one can only use four of the sixteen on the screen at one time). This means that it is virtually useless to use business programs on a colour screen. This has not been a worry in the past and I maintain that colour is not appropriate to concentrated use, many hours a day, but times are changing. Colour screens have become better and some of the best business software is now using selective colour. In graphics and 40 column text modes, the Graduate has normal BBC colours available.

Thirdly, and slightly more serious are limitations of the graphics. For rather complex reasons (for explanation see separate box) the Graduate does not perform cer-



1 Graduate and Xchange software

NOTE FOR THE TECHNICALLY MINDED

The 6845 "video-generator" chip in the BBC Micro still runs the screen. The IBM PC also uses a 6845, so what is the problem? Strangely, it is to do with the superb screen performance of the BBC. The 6845 chip uses no less than eighteen "internal registers" (fast, tiny memories actually inside the processor itself) which, in modes 1 to 6, save the user the trouble of handling most screen functions.

To further help the user, he or she is not expected to know which register to use: there is one single "post box" provided in the computer's main memory. Into it you post each instruction (which, like any letter, must bear both the message or instruction *and* the address.)

Now we come to the problem: the "post box" is in the BBC's memory, not in the Graduate's. Some PC programs, such as *Flight Simulator,* work very closely and rapidly between the 8088 central processor, its main memory and the screen, to achieve complex, exciting, rapidly changing graphics. But with a BBC/Graduate combination, the 8088 looks for the post box in its own memory and finds none there. Think of a centre-forward, trying to create a fast attack along the axis of the game. He swaps the ball rapidly with his inside forwards, always keeping the opposition on the wrong foot. But once his insides are not there in support he is foiled: to try and do the same with a winger or centre-half would slow the assault and lose its dynamic effect. The 8088 has not been taught to look for a screen post box in the BBC and, even if the program was rewritten to do this, the speed of that intimate screen/processor combination would have been lost.

tain kinds of graphic programs, such as the famous Microsoft *Flight Simulator,* in the same way as the PC does. So do not buy a Graduate if you want to run this kind of software.

HARDWARE

Graduate comes as a six-inch deep box, ten inches wide and sixteen inches from front to back, in the front of which are mounted dual disc drives. It is made of steel and pleasantly finished in two-tone grey. Remove the top cover (an easy task) and you will see: the two Cannon disc drives, each with a capacity of 320 KBytes after formatting (production models use Epson drives, which Torch say are quieter); a power supply and cooling fan; a single, large printed circuit board on which are mounted the 8088 processor, an impressive army of RAM chips and the two welcoming expansion slots.

The good feature is that the unit will operate on one side, with the disc drives vertical. Although it looks rather silly, with its four rubber feet waving in the air, this is a most convenient arrangement as the 32-way ribbon cable that connects it to the "1MHz bus" connector underneath the BBC's keyboard, is lamentably short. The alternative would be to have the Graduate sit at the right hand side of the BBC and there would be ample space on it for a modem or document holder. The BBC needs no internal ROM (permanent memory chip) fitting, so connecting the Graduate to the Beeb is a matter of a few seconds: insert the ribbon cable and plug the Graduate into the mains. Switch on, and it "boots" (loads, automatically) MS-DOS from the "system disc". Now you are ready to load any application program. I have been used to a Z80, with the operating system held on a ROM, and found it rather tedious to have to load MS-DOS every time I switched on, but users will soon develop their own procedures.

MS-DOS uses a "batch-file" technique. You write a simple list of commands, which you save as a special file on your system disc. This can contain instructions to change screen colours, switch on the printer, load the applications program and select the correct disc drive for the program files. It can be automatically executed when you boot MS-DOS.

THE BBC AND THE GRADUATE

How does thecombination feel to the BBC user? The first thing I noticed was that my screen had lost seven whole lines! Now it only has 25 and I miss the extra seven, for reasons explained below.

On the review model the screen scrolled, rather jerkily (due to the screen memory all being held in the Graduate box and having to come across the 1MHz bus) but I soon found I could ignore this and Torch tell me it has been corrected on current production models. More frustrating was the loss of the BBC's split cursor, with which you can COPY lines higher up the screen. With MS-DOS, various function keys have been trained to copy previous instructions, but it seemed much less easy.

I also felt cheated that I could only store 320 KBytes on two sides of a standard 5 1/4" floppy, instead of over 400 with the BBC's DFS (and 800 if you use double-density).

On the credit side, MS-DOS is a much wider and more powerful operating system than the Beeb's MOS. Just to give one example, you can "pipe" the results of one program back into another program, without having it appear on the screen at all. I used this on disc catalogues (called "directories" in MS-DOS), so as to arrange the files in a convenient alphabetical order. This overcomes the "hunt-the-file" problem that bedevils any user with more than half a dozen discs full.

XCHANGE SOFTWARE

Whatever the virtues or vices of MS-DOS, Torch have chosen well to offer the Graduate with Psion's integrated software suite. It comprises four modules: word-processor *Quill,* spreadsheet *Abacus* , database *Archive* and a sublime business graphics program, *Easel.* No less than seven files, in any combination of these, can be held in memory at one time.

QUILL

The best thing about *Quill* is that it is very simple to use. Otherwise I found it rather disappointing. Six lines at the top and three at the bottom of that already reduced screen are occupied by program "prompts", so you have only 16 lines to use for text. There is no windowing or split screen facility so you can only view one text at a time, although there are various commands for making changes to texts held in memory but not on the screen.

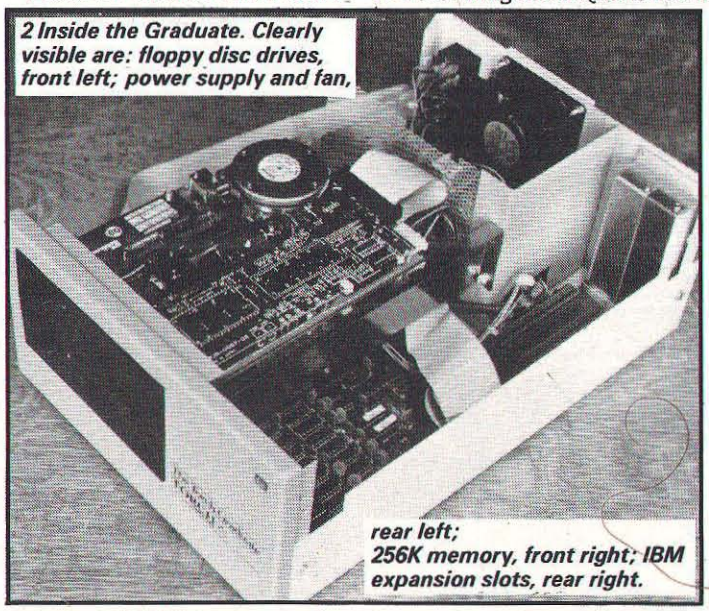
But my main criticism is that *Quill* is very slow. If one has a part-written document saved as a disc file, this cannot be loaded direct onto the screen. Indeed, from switching on the machine, you have to:

Load MS-DOS
Change the default disc drive
Load Xchange, to give a menu
Select QUILL:NEW TASK and type in the name of the task
Press function key f3 to get the command menu
Select "Load" on the command menu (single letter 'L')
And finally type in the file name and Return.

I timed this to take 1 minute 25 seconds compared with less than 30 seconds for comparable word processors but this could be speeded up by writing an MS-DOS batch file.

Cursor movement is also very slow. Using the arrow keys, with or without Shift, you can move one letter or one word in either direction and there is a "GO TO" command which takes you to the top or bottom of the text or to a specified page number. However, there are no commands to go to the start or end of a line, sentence or paragraph and the cursor on its own moves slowly and jerkily. I found that, in various situations, the screen could not keep up with even my tortoise-like typing speed, especially if I did short words on a series of new lines, like a shopping list.

However, what is lost in speed of execution is regained by reliability and ease of use. I found I made very few errors using *Quill.* Learners, or those who have found more sophisticated word processors difficult, will warm to it. It is a "wysiwig" (what you see is what you get) word processor: it has a ruler at the top showing the 80 print positions and, at the bottom, a clear statement of which word, line, page, task and document you are on and whether you are in INSERT or OVERTYPE mode. You can set your page length and a neat dotted end-of-page line appears, so there



2 Inside the Graduate. Clearly visible are: floppy disc drives, front left; power supply and fan, rear left; 256K memory, front right; IBM expansion slots, rear right.

CONTINUED OVER

is no chance of printing a sub-heading and then having an embarrassing page break before the text appears. You can overide the page breaks, if you want to leave space for a diagram or table, rather than begin it three quarters of the way down a page.

There is also provision for putting headers and footers (a standard line of text at the top or bottom of each printed page) and these can be at left, right or centre but there is no facility for alternating them, for documents printed on both sides of the paper. Variations in text presentation, such as double-spacing, are easy and a series of typefaces are offered: bold, underline and italic plus super- and sub-script but none of these are indicated on the screen text, so editing could be very difficult: you would not know what you had underlined. There is a full range of copying, merging, deleting, search and replace commands, all of them simple but slow. Finally there is a clever glossary facility: you can make any key on the keyboard memorize a sequence of characters or commands (up to a limit of 250 characters) which you can then call up with two key-strokes. Once again, retrieving is slow: each letter is printed out singly on the screen, at a rate of under four characters per second (much slower than a competent typist) which rather takes away the value of the facility.

Quill has its own "mail-merge" procedure. This can either:

Use a separate file that contains the various name, address and data lists, not unlike the MACRO facility in Acornsoft's *View*, or
Accept variable data, typed in each time at the keyboard or
Accept suitable files "exported" from the *Archive* database.

I shall not assess this in detail as I plan a complete article on mail-merging shortly.

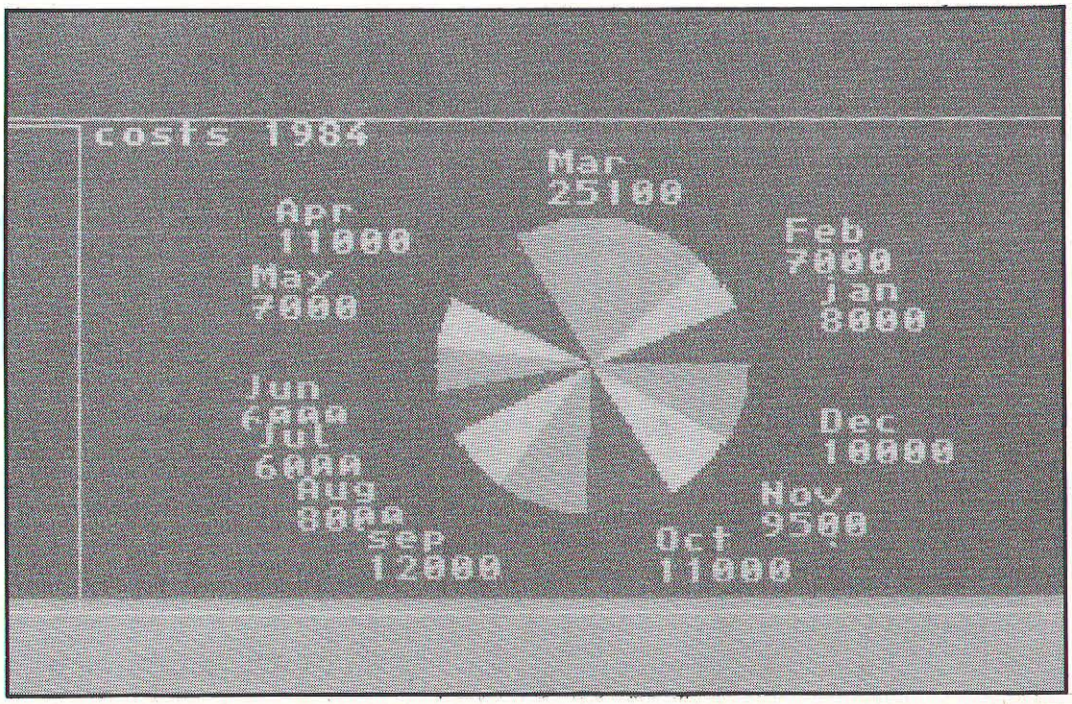
ABACUS

As a businessman I liked *Abacus* immediately. Usually spreadsheets are rather impersonal: every entry is referred to by a row number and a column letter and I soon get confused. Friendly *Abacus* allows you to label a row or column and thereafter refer to it by its label. So a furniture manufacturer can draw a production chart, label his rows: DESKS, TABLES and CABINETS and refer to them by those names when entering data. It will also write in the month at the head of each column, normally a tedious and repetitive task that just asks the computer to take it on. Best of all, if you insert the number of desks you are going to make in January, then decide to increase it by 2% each month, entry of a simple, single formula will calculate the figures for each succeeding month.

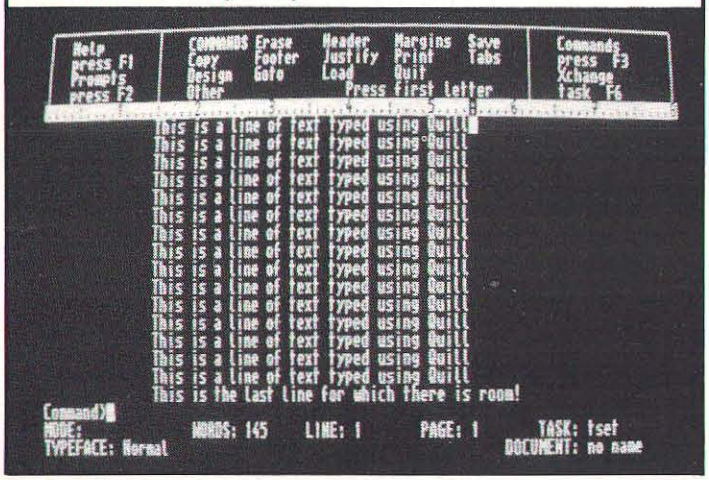
You can refer to a cell on one spreadsheet, that is not on the screen, from another that is dependent on it. So, when working on his SALES PLAN, our master joiner can decide that the price per desk will increase by 10% in June and see the result **without** having to bring his PRODUCTION SCHEDULE back on the screen at all. Also appealing to the business man is the security arrangement: any file can be protected by a password, without which it cannot be loaded. The most intimate details of company profits could safely be held on a computer in an open office.

The *Abacus* screen can be split

3 The unit will operate on one side, with the disc drives vertical.



4 Quill: six lines at the top and three at the bottom of the 25-line screen are occupied by program "prompts", so you have only 16 lines to use for text.

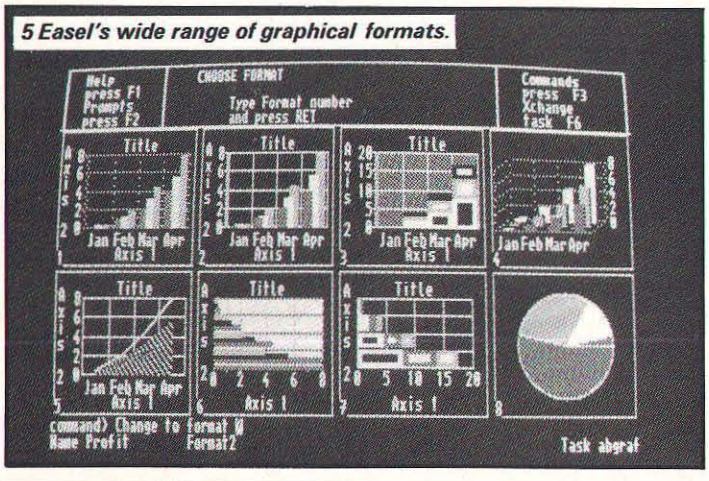


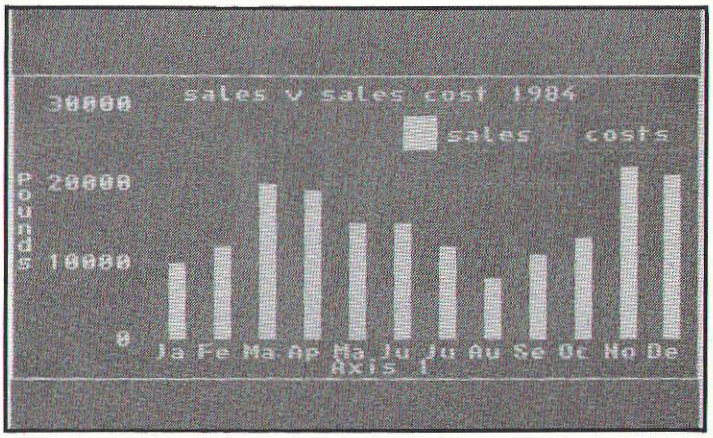
into two windows and these can be either linked to scroll together or left operating separately. There is the normal range of commands for altering the way in which data is presented: the number of decimal places, whether it is justified to the left or right of a cell, whether printing is double-spaced and so on. Also, there is a most convenient sorting procedure. Suppose the spread sheet is used to calculate the "economical order quantity" for a number of items in the furniture warehouse. Each item would take up one row which would contain a catalogue number, the item name, the supplier's name, the price and so on. Perhaps the spread sheet was drawn up in numerical order of catalogue numbers but the buyer wants to collect together the items from each supplier. *Abacus* will sort it by suppliers.

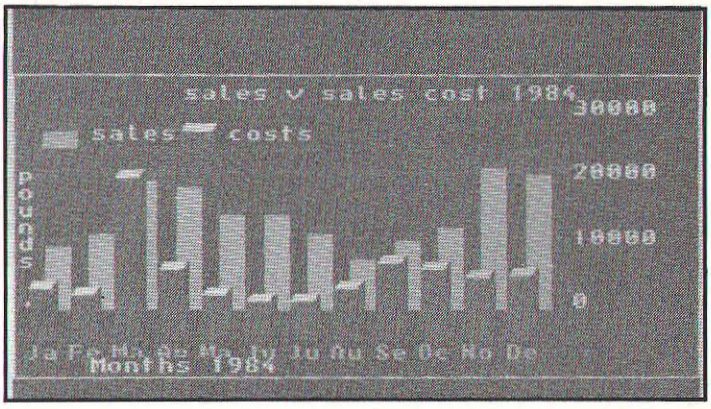
He then wants to arrange it in order of price, so that the senior buyer negotiates the most expensive and a junior clerk handles the cheap items. *Abacus* will re-order it using the price column. The only limitation concerns any part of the spreadsheet that contains formulae. This will be invalidated, so the feature has to be used with care. There is also a (much appreciated) facility to fix the vertical and horizontal titles of the spreadsheet — any of them, not just the topmost line and left-hand column.

Abacus offers a wide range of mathematics: all the common arithmetic functions, such as averages, exponentials, integers, logs, square, roots etc.: an adequate range of trig functions (although they require the angles to be presented in radians, whereas most people are used to working in degrees; however there is a degree-to-radian conversion) and a couple of financial functions: net present value and internal rate of return. However, there is a shortage of statistical functions such as standard deviations and rather a surfeit of "computerish" ones, such as CODE, which returns the ASCII value of the first character of a word of text: of limited use to anyone outside the computer business.

5 Easel's wide range of graphical formats.







ARCHIVE

Archive is a database with a programming language and reminded me strongly of *DBASE II*. It offers the same three basic functions:

1 Create a database "card-index" structure. Each card, called a "record", can have up to 255 fields (far more that the miserable 32 allowed by *DBASE III*), each of which can hold numbers or alphabetic characters and can be up to 255 characters long.

2 Create screen presentations, both for inserting and displaying or altering the information.

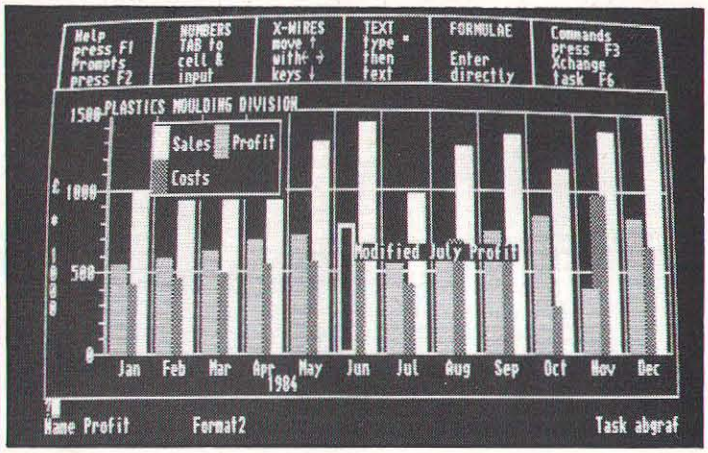
3 Write programs to handle the data contained in the records. For example, if one has a database of names and addresses of customers, one can write a "command program" that will select all the customers who lived in a certain town and then print address labels. With a database of employees, one can write a program to calculate wages, tax: a complete payroll program in fact.

It is in the programming language that the greatest similarity to *DBASE II* is evident, with "IF/ENDIF" loops, APPEND commands to add a record to a file, and ORDER (to perform the same as *DBASE II*'s INDEX function). In addition to the language, there are

CONTINUED OVER

a number of programming functions, many of them the same as those used by *Abacus* but also some familiar to users of BASIC, such as GETKEY and INKEY. Despite being integrated with *Quill* word processor, *Archive* also provideds a special program editor for compiling its programs, although one can also write *Archive* programs using *Quill*, then EXPORT them.

1 Bar charts, line curves or pie charts
2 Vertical or horizontal
3 Side by side, overlapping or stacked (one on top of the other)
4 Use of the complete range of screen colours plus shading variations
5 Graph borders of variable thickness and colour
6 40 or 80 column display and printing



6 In a few seconds Easel changed from this vertical bar chart

A word of warning however. All the other *Xchange* programs are characterised by simplicity and ease of use. Writing database manipulation programs, which may use any from a vocabulary of some 80 programming commands, plus a further 40 function descriptions, is neither quick nor simple. Although the handbook and tutorial program provide a certain amount of help, I was rather suprised that *Archive* did not come with a number of standard programs for doing simple tasks. In my experience the average user will, unless he keeps his tasks short and simple, need to spend several late evenings to produce *Archive* manipulation programs that do what he wants. It will be well worth it..... but warn your spouse not to stay awake waiting!

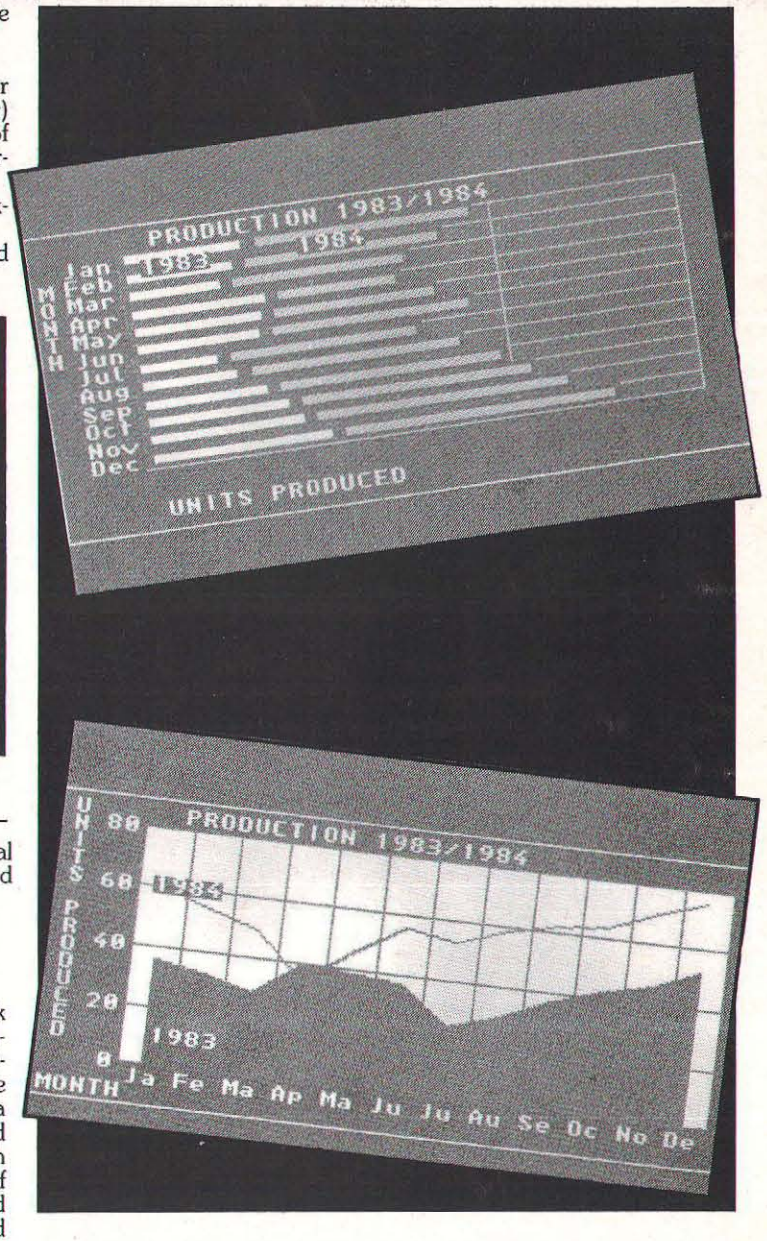
EASEL

Easel is a business graphics package with a wide range of choices:

7 Text labelling plus special arrangements for graph titles and axes.

HANDBOOKS

The *Xchange* Software handbook would be, but for one thing, excellent. It is split into two parts: a how-to-do-it section, for the complete suite and for each member, and a reference section that lists and defines the commands for each module. Wide use is made of screen diagrams and worked examples and there is a detailed and excellent contents list at the front. Its major shortcoming is the lack of an alphabetical index. I find it *extraordinary* that those, who present programs of such complexity and sophistication, do not realise how handbooks are used. Some users will read logically through once only; most will not have time. Thereafter a handbook is used like a dictionary: you look up what you need. With no index this is a nightmare! I discovered, only at the very end of two solid days spent exercising these programs, that it was possible to use *Quill* to edit the *Archive* programming language. This gem of information, lack of which might result in a user spending hours of work unnecessarily, is buried deep in the text. An alphabetic index in which one could look up the word 'EDITING' would have revealed this in a few seconds. From Torch, one of whose main products is *Perfect Writer* wordprocessor with an "indexing" facility, I find it incomprehensible! It is a great pity that superb documentation should be spoilt by this shortsighted omission of a vital feature.



***Printed on an Integrex printer, these show various graphics produced on Easel with incredible** ease!*

ASSESSMENT

For the cost-conscious businessperson, who has been using a BBC Micro and discovered that it is not nearly powerful enough, there have in the past been two choices:

1 To fit a Z80 second processor, giving access to a range of CP/M software that can run with only 64K of memory.

All the suppliers of Z80 offer bundled software but it all has limitations, mostly associated with shortage of memory.

2 To throw out his BBC micro and go to a professional business system, such as the IBM PC or Apricot XI but he will see little change out of £2000.

Graduate offers a third course and it will appeal to many: for another £1000, he gets a twin disc machine, with abundant memory, access to the whole huge range of IBM PC compatible software, and an excellent suite of integrated software which will handle his general administration needs. If he wants to expand thereafter, he can put in more memory or add an IBM-compatible hard disc costing around £1300.

I believe this is a choice many people are going to find very attractive. Despite some shortcomings, Graduate plus *Xchange* is **excellent** value.

I much preferred the 80-column graphs. The key box occupied less space: in 40 column it seemed to obscure quite a lot of important data. (One would pay the penalty by loss of colour of course.) Graphs can be marked with symbols, which in turn can vary in colour and shading and line graphs can vary in thickness. Bar charts can be created with isometric (three dimensional) perspective and pie charts can have one segment removed sideways to focus attention. As well as using the wide calculating powers of *Abacus*, *Easel* has its own formulae, although these are rather more limited.

I found *Easel* brilliant: incredibly flexible and extremely easy to use. There is no fiddling about trying to work out the best axes scales: that is all done for you. The speed, with which one can alter the presentation of data to display it to best advantage is breathtaking. The photographs show identical data, altered within seconds from vertical, three dimentional bar charts to horizontal bar chart and to pie chart.

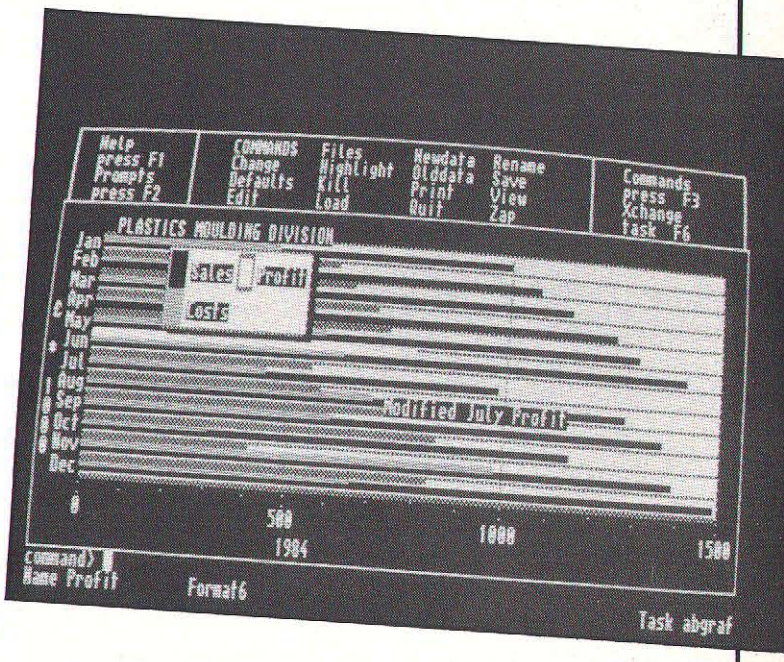
INTEGRATION WITHIN XCHANGE

Thus far the *Xchange* programs are conventional. It is in its ability to swap data from one to the other that the true power of the *Xchange* Suite becomes apparent. You can extract information from the database and feed it into word-processed text or into a spreadsheet table; you can represent tabular spreadsheets in graphical form; you can incorporate tables within text reports.

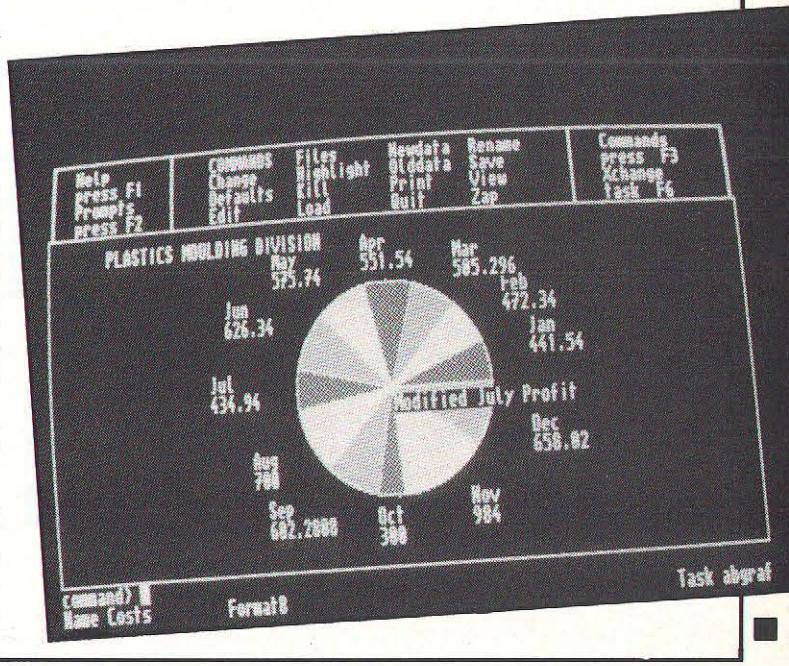
This transfer of data can be carried out in two ways: either you can create an intermediate data file or transfer directly. Data transfer files are nothing new. Innumerable people have used *Multiplan* data in a *Wordstar* report for example. *Xchange* scores because all the formats and codings used are compatible. Each program has an EXPORT command, to specify which data is to be transfered and an IMPORT command, to denote which file is to be received and where it is to be put.

Switching data between the modules is extremely easy. It took me a few seconds to export the contents of a spreadsheet budget to *Easel* and have it turned into lucid, helpful graphs. It was equally easy to transfer the same data into the body of a *Quill* report but, to my great disappointment, you cannot export *Easel* graphics straight into *Quill*. If you want to incorporate graphs in your report, you would have to print them out separately and modify page numberings accordingly.

Abacus has joined the big league, of sexy, integrated software suites such as *Symphony* and *Lotus*, because it can transfer data *without* creating intermediate files. It is this ability which justifies integration of all four programs within a single shell, the cause of my earlier complaints about slowness and the tedious loading sequence. The process of transfer is intricate and users would need to gain experience but an excellent tutorial disc is very helpful. In painless, easy-to-run lessons it leads, step-by-step, through the IMPORTING and EXPORTING processes.



7 to this horizontal chart and 8 this pie chart



DESIGN A DIESEL

Alec Bray

Learn more about computer aided design by creating your own locomotive.

There is a growing interest in the use of computers for CAD work. This program is an attempt to move in that direction, in that it enables the user to see very quickly on the screen the result of manipulating certain design parameters.

The diesel locomotives of British and foreign railways have been chosen as the subject. By setting measurements by means of the cursor keys a very wide variety of locomotives can be designed. The program is useful as a "preliminary sketch" or for the designer to indulge in a bit of "what-if"ery.

Some people may consider that the modern diesel locomotive at work on the railways of the world is little more than a "box on wheels", but in fact there is a great variety in the types and shapes of modern motive power. The program to be described will allow you to draw — or design! — in outline a very wide range of different diesel locomotive types, from the humble shunter to the mainline express!

It is a *simple* design program, in that it expects the locomotive to conform to a set of predefined characteristics, which, although they allow considerable flexibility, do impose some constraints: on the other hand, it is not simply a drawing-type program, for you will be able to design locomotives which have not been built! There is a minimum of detail in the finished drawing — this is to keep the program relatively short. I have not included any colour for the locomotives: one reason is again to keep the program simple, but the other reason is more practical — you can draw a diesel locomotive from any railway system in the world, in which case BR blue and yellow would be inappropriate, and in any case BR locomotives are on their fourth livery style!

It would not be too difficult to add routines to block in colour where needed (although you would probably need to use NODE 5 with attendant loss of detail). Similar considerations applyu to the bogie sideframes: these are sketched in a rudimentary form to give the right impression, but given the wide variety of bogie sideframes in use, the program would have been unduly complex to catalogue them all. The program then is not for the 'purist' or the 'rivet-counter', but rather for the person who fancies their hand at a bit of Computer Aided Design on a modern railway theme: and any successfully designed locomotives can be added to the program!

PROGRAM STRUCTURE

The program can be subdivided into four major groupings of procedures. The first group is concerned with the initialising of the variables and the main program loop (PROCinit, PROCvar, PROCmenu). It also includes the *KEY 0 definition (line 10) which is used to add your own data into the main program, so it will be instantly accessible on further runs (see later). The main program loop is line 20:

```
20 MODE 1: PROCinit:
REPEAT: PROCmenu:
UNTILY$ = "Q": MODE 7:
PRINT TAB(15,5);"END": END
```

The second group of procedures find the values that are to be scored in the main array — this is a 28 element integer array M%(0) ... M%(27) (c.f. Table 2). The data can be read in directly from the DATA statements using PROCread (lines 90, 120) or can be built up by adjusting dimensions, typically using the cursor keys. (PROCnew (lines 160, 170)). Sizes and start positions are set from the keyboard, and the effects can be seen on the screen: keep adjusting until you are satisfied!

There are a number of routines to help in the adjustment of the measurements — PROCsize finds the measurements given in feet and inches, PROCarrow points to a place on the screen (and calls PROCpoint). PROCget gives a prompt and waits for a response: PROCwait waits for the space bar to be pressed. The fourth group of procedures are called by PROCdrawn, and calculate the various coordinates and draw particular parts of the locomotive on the screen (PROCtrack, PROCwheels, PROCcab, PROCbody). These are also called by the equivalent setting procedures called by PROCnew (i.e. PROCwheelset, PROCcabset, PROCbodyset) and so have a *colour* parameter passed to them, so that they can be redrawn in black (i.e. erased). A list of the procedures used is given in Table 1.

TABLE 1: LIST OF PROCEDURES USED

PROCadjust	(positions, limits, name)
PROCarrow	(positions, upper and lower limits, name)
PROCbody	
PROCboydset	
PROCbuff	
PROCcab	(colour)
PROCcabset	
PROCcirc	
PROCcurveA	(start and finish horizontal and vertical measures)
PROCcurveB	(start and finish horizontal and vertical measures)
PROCdraw	
PROCget	
PROCinit	
PROCmenu	
PROCnew	
PROCpoint	(horizontal position, vertical position, colour)
PROCread	
PROCsingle	
PROCsize	(name of the part)
PROCtrack	
PROCvar	
PROCwait	
PROCwheels	(colour)
PROCwheelset	

HOW IT WORKS

The data for the locomotive is stored in the 28 element integer array. Some of the elements refer to absolute displacements from the vertical origin (the origin is set to roughly halfway up the screen by VDU29,0;500; in line 130 and all vertical measures are displacements from this, and are the coordinates used). Some of the elements are the horizontal co-ordinates required; sometimes these are the absolute displacements from the horizontal origin (0) (i.e. the actual co-ordinates required), but sometimes these are the relative displacements from other horizontal markers. The reason for this is that if you are drawing a symmetrical diesel locomotive, it is simpler to take two end markers, *add* a displacement to one end and *subtract* the same displacement from the other end! Some of the array elements are flags and some are measures and numbers. (See Table 2.) This array can be constructed "from scratch", but it is easier to use the program! All measurements are taken to the

TABLE 2: ELEMENTS OF THE INTEGER ARRAY

M%(0)	"flags" (bits 0 inside frames: 1 single ended: 2 cab windows)
M%(1)	Number of wheels per bogie
M%(2)	Radius of wheels in inches
M%(3)	Wheelbase (distance between the whole) in inches
M%(4)	Horizontal position for the start of Cab A end bogie
M%(5)	Horizontal position for the start of Cab B end bogie
M%(6)	Horizontal start position for Cab A
M%(7)	Horizontal start position for Cab B
M%(8)	Horizontal start for lower ("bonnet") curve
M%(9)	Vertical start for lower ("bonnet") curve
M%(10)	Horizontal end point of lower curve
M%(12)	Horizontal position of the bottom of the windscreen
M%(13)	Vertical position of the bottom of the windscreen
M%(14)	Horizontal position of the top of the windscreen
M%(15)	Vertical position of the top of the windscreen
M%(16)	Horizontal position of the end of the roof curve
M%(17)	Vertical position of the end of the roof curve
M%(18)	Cab width (single ended diesel)
M%(19)	Engine compartment height (single ended diesel)
M%(20)	Horizontal position left hand bottom of grille 1
M%(21)	Vertical position left hand bottom of grille 1
M%(22)	Horizontal position top right hand corner of grille 1
M%(23)	Vertical position top right hand corner of grille 1
M%(24)	Horizontal position left hand bottom of grille 2
M%(25)	Vertical position left hand bottom of grille 2
M%(26)	Horizontal position top right hand corner of grille 2
M%(27)	Vertical position top right hand corner of grille 2

Even numbered elements from M%(8) to M%(18) inclusive are "relative" measures: they are displacements from the cab start position M%(6) to facilitate the drawing of twin-cabbed symmetrical diesels, all other elements from M%(4) inclusive refer to the screen coordinates used.

nearest inch: the locomotive is drawn to the nearest inch — although because of the scale used, the longest loco can only be some 65 feet over buffers.

An integer array was used because of the speed of arithmetic and reduction of memory requirements — but one very useful feature is that one element can be used to store a number of flags. M%(0) stores three flags — figures 1-3 show the effect of the status of each of these three bits. Bit 0 (lowest significant bit) is set to 1 if the locomotive has inside frames to its wheels — two types of mainline express locomotives on the Western Region (the WARSHIPS and the WESTERNS) had inside frames, but it is most commonly found on diesel shunting locomotives.

Bit 1 is set to 1 if the locomotive has a cab at one end only, like some BR freight diesels and many American designs. In terms of this program, this is termed "single ended" and is set by M%(0) = M%(0) + 2.

The third flag determines whether there are to be one or two windows before the driver's door; for two windows bit 2 is set to 1 by M%(0) = M%(0) + 4.

To see this in operation, assume that the last few digits of the interger stored in M%(0) are .....00101 : this is a double ended diesel with inside frames and two side windows. This information is accessed by AND-ing M%(0) with 1 or 2 or 4, as a bitwise comparison it is a very convenient technique.

RUNNING THE PROGRAM

Once the program is run, PROCmenu gives you the choice of seeing the last-drawn locomotive in detail, to construct a new design, to draw a locomotive from data stored in the program — or to quit. Choosing to see an existing "design", PROCread provides a secondary menu — showing different types of locomotives and a number. The response is obtained using a GET$ statement — principally because, with the text window as set, there is only room for the display of ten locomotive types! The value of the number "got" is used to control the data reading loop.

Only two freelance locomotives are given initially — firstly to keep the program short and secondly to make it easier to add your own data using f0 (see later). PROCdraw calls the procedures to draw the locomotive. If you wish to design a new locomotive, PROCnew has to reinitialise some of the variables (which is why PROCinit itself calls a procedure). PROCvar resets the array variables, and sets A% to 0. A% is another flag — this one signalling that detail is, or is not, required. While the loco is being drawn it is not necessary to do all the detail — for example, the track will be a simple straight line. When the loco is ready to be seen in all its glory, A% becomes 1 and the track is drawn with sleepers and ballast. The ballast, by the way, is a continual redefinition of a user-defined character, VDU240, constructed by randomly inserting a power of two into each of the eight rows of the character (line 580), and then printing this.

The next thing to do is to decide on the number of cabs. The vast majority of slow shunting locomotives have single cabs, whereas British express diesels have two cabs. These are known as cab A and cab B, in the program the Cab A end is at the left hand side. Three setting procedures are called in turn: PROCwheelset, PROCcabset and PROCbodyset.

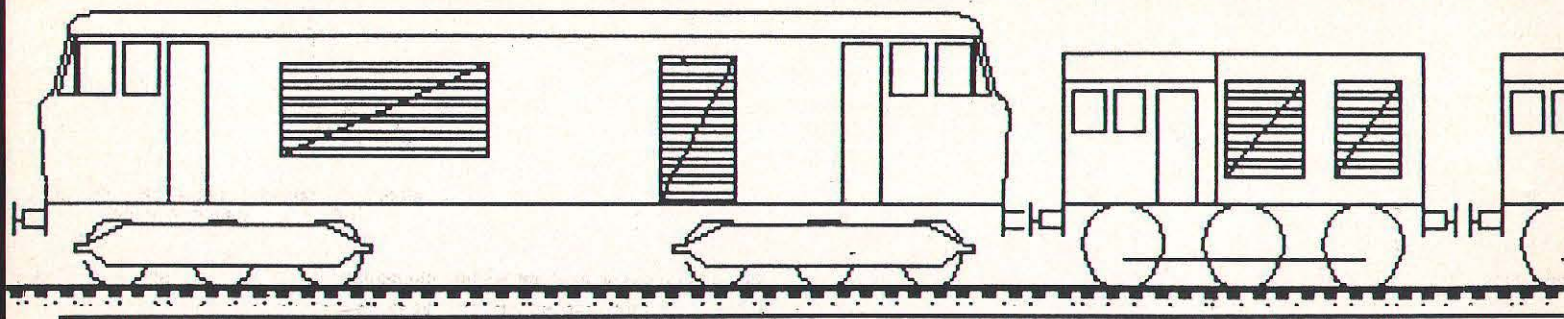
PROCwheelset asks for the number of axles per bogie — the limit is six. The program assumes that the wheels are all going to be the same diameter, and that they will be the same distance apart (neither of which is necessarily true on the real thing!). The limit on the diameter of the wheels is 4 feet 1 inch (ah yes! the program uses imperial measurements. Many interesting British diesels were designed before metrication and for these information can be entered directly from published sources. To change to metric measures, just alter PROCsize accordingly). The limit of 4′ 1″ is used to make the program simpler — no wheel will extend above the floor of the engine compartment.

The wheel base is the distance between the centres of each pair of wheels and is NOT the overall bogie wheelbase (except in the case of two axle bogies). The minimum wheelbase is bigger than the diameter of the wheels — otherwise the wheels would overlap or touch! Once the wheels are drawn (PROCwheels) you can adjust the starting point for each bogie separately. A pointer is moved until it reaches a satisfactory position, at which point the wheels are redrawn. The pointer is drawn by PROCarrow: it is used throughout the program to set the positions of all subsequent items. PROCarrow draws a vertical and horizontal line at specified positions, and moves them between preset limits by means of the cursor keys. All values (positions and limits) are passed as parameters, and the syntax is:

PROCarrow (horizontal start, vertical start left horizontal limit, right horizontal limit, lower vertical limit, higher vertical limit, name of item adjusted)

The procedure is terminated by pressing RETURN, variables W% and Z% taking the vertical and horizontal co-ordinates respectively back to the calling procedure — and are used to adjust the array elements. However, the program now prompts "Is this correct Y/N" and any other key but "Y" from PROCget will repeat the adjustment phase. Once "Y" is pressed, however, the program moves

CONTINUED OVER



onto the next stage, and that particular value can not be changed further.

For the bogie adjustment only one arrow, the horizontal one, is adjusted of course, although as we have seen, the syntax for PROCarrow allows either horizontal or vertical arrows, or both. For speed of adjustment the cursor keys are tested using the INKEY technique: using GET$ slows the program considerably. If a horizontal arrow has been set, on pressing RETURN a small arrow is placed where the pointer was positioned — and this remains in position until the locomotive is complete: it is very useful to have these arrows as guides when making subsequent adjustments.

It is possible to draw a diesel locomotive without bogies — i.e. with just one set of wheels, as in a diesel shunter. This can be achieved in the program by setting the cab A end bogie to its extreme right hand position (so it starts at 500,0) and by placing the cab B end bogie to its extreme left hand position (also at 500,0): the two "bogies" now overlap exactly — giving one set of wheels. Line 610 tests for inside frames (IF (M%(0) AND 1) and for the same starting point for the bogies (IF M%(4)=M%(5)). If both conditions are met, it automatically draws coupling rods: many classes of small diesels use outside coupling rods as did the steam locomotives, however, one limitation is that the program will not (yet?) cope with jackshaft drive.

Since in the vast majority of diesel locomotives the bogies are the same at each end, this is what the program expects: Therefore the procedure for drawing the bogies is run twice, the only difference being the starting point, M%(4) or M%(5): FOR K%=0 to 1: V%=M%(4+K%): .... : NEXT (c.f. line 590). The procedure for drawing the wheels calls on the procedure PROCcirc to do the actual circle drawing, the variables used being V% (the next position for drawing a wheel, updated each time by adding on the wheelbase (M%(3))) and M%(2) (the radius). The circle could be made more accurate by decreasing the step size for the radian increment for the SIN and COS functions — but makes the program slower.

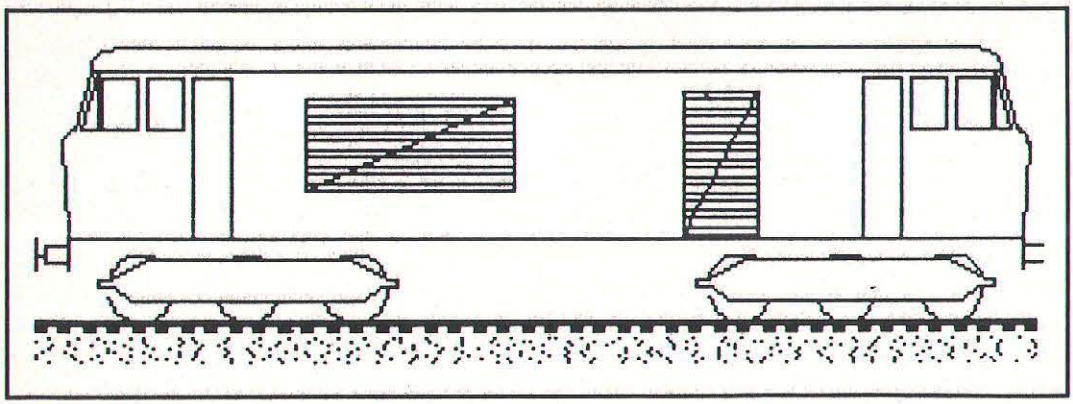
PROCcabset first establishes the horizontal position for the bottom of the cab front. This is assumed to be the position of the buffer beam — which is true for the majority of the diesels, but not exclusively! The overhang of the body beyond the wheels is assumed to be symmetrical at either end. The initial position of the cab front (M%(6) and M%(7)) are initially derived from the bogie start position and wheel radius but can be adjusted horizontally with the cursor keys. As with the other calls to PROCarrow, the routine for the program is:

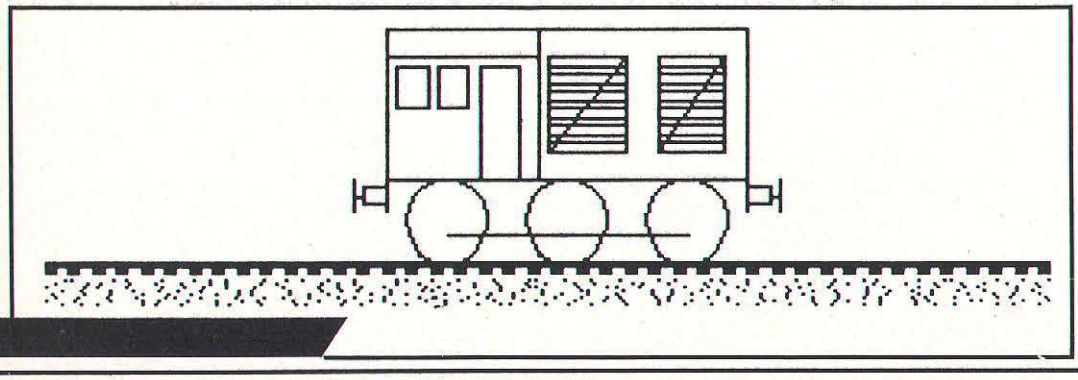
REPEAT: PROCarrow (parameters): (adjust variables): PROCget: UNTIl Y$="Y"

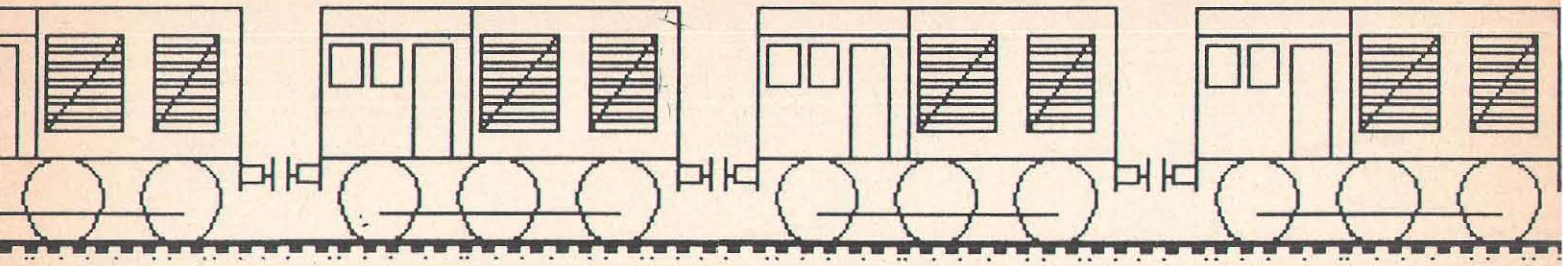
CURVES

The program assumes a basic cab contour as shown in figure 4: in principle there is assumed to be a curve below the windscreen and a curve above the windscreen forming the front of the roof. By careful adjustment of the cursor keys a wide variety of different "curves" can be produced. The program will, of course, always draw full quadrants but by adjusting, for example, the horizontal component of the end of the curve to be within the limits of the resolution of the computer's line drawing capability, some apparently composite curves can be drawn: figure 5 shows a "cheated" composite curve. This is the reason for adjusting the vertical and horizontal pointers for the end of the curve independently: because there is no error checking you can produce the occasionally bizarre effect, but with practice a variety of shapes can be drawn.

By making the start and finishing points of the curve to be at the same place (by simply pressing RETURN when given the prompt — this section of the program has been written to move quickly to the next stage if no adjustment is ncessary), the curve will NOT be drawn (in one case a curve radius 0 is drawn, in the other the computer checks for similar positions). Hence a polygonal profile can be drawn — or a slab-fronted design! The start of the first curve may be in front of the cab bottom position — some British diesels like class 47 have a "leaning forward" lower cab front — but thereafter there is some error checking in that the last horizontal and vertical positions to be set become the leftmost horizontal and lower vertical limits for the next adjustment. Since these adjustments form horizontal vertical pairs, it is convenient to write a loop to cope with all cab co-ordinates (line 280). There is a difference, of course, for the first pair's limits, but these, and the subsequently derived limits for the remaining pairs, are passed as parameters to PROCadjust. This in turn calls PROCarrow and sets the variables as a result. The only changes through the pairs include the array elements used and the same of the part being set, the latter being read from data line 310. As mentioned earlier, if no adjustment is made, the next stage is jumped straight







to, without the confirmatory prompt and response. During program development I felt that it was not necessary at this stage, but could easily be included.

If your diesel is a single-cabbed version there are some apparently extraneous line which will appear! PROCsingle allows you to set the width of the driving compartment, and to set the height of the engine compartment — this is not necessarily the same as the height of the cab.

However, the engine compartment is drawn initially at the current maximum cab height — at all stages of the drawing. This is to achieve a less complex program! The cab is drawn from the bottom up (buffer first), cab A end being drawn first. If the diesel is double-ended, cab B end is exactly symmetrical to the cab A end. All vertical co-ordinates are the same with horizontal displacements subtracted rather than added, with respect to the reference position. There is, of course, one major difference — the curve! The quadrants at the A end go clockwise, and those at the B end go anticlockwise — which is why there is a PROC-curve A and a PROCcurve B.

DETAILS

PROCbody fills in some details — it joins the two cabs together forming the roof in the two ended version, or forms the roof for the single ended loco. Two variables, R% and RR%, are set to the cab width for the single cab or to the roof coordinates of the B end cab depending on the setting of the flag (IF (M%(0) AND 2)). If the windscreen has a sufficient slope (i.e. there is a difference of 20 units at least between the top and bottom windscreen horizontal displacements) then a triangular quarter-light will be drawn.

PROCbodyset asks whether there are to be one or two windows between this quarter-light (if drawn) and the driver's door. Choosing 2 sets bit 2 in M%(0). PROCbody draws these side windows at the same vertical positions as the windscreen (and so it won't, I'm afraid, reproduce a locomotive like the class 55 DELTICS) and the width of the windows is based on the height of the windscreen. This achieves a reasonable balanced result in the majority of cases, but it would be a reasonably simple matter to make the windows adjustable in position and size, although it would mean increasing the number of elements in the array. I have left in its untidy form the sequence for finding the start position of the windows and the driver's door, to make it more accessible if any changes are wanted! HW% is the start position for the next window: (N% is the number of windows)

```
FOR I%=1 TO N% +1: HW%
= M%(7) - M%(14)
-12*I% + (I%
-1)*2*(M%(15) - M%(13))
DIV 3: ..... : NEXT
```

This, of course, is calculated on each pass through the loop — not fast! The point is to try to achieve a consistently pleasing appearance without making the program too unwieldy or without requiring too many very small adjustments to be made. Looking at many diesels, there does seem to be a relationship between the size of the windscreen and the height and width of the side windows, and on many of the trial locos drawn using the program the relationship looked possible! The driver's door is always drawn down to the level of the buffer beams: this is where the program could well be adapted to draw the door to the bottom of the body or to a drop of, say, 78 inches, whichever was the least. This would improve the appearance of the locomotives!

PROCbodyset also allows two major grilles to be drawn. A distinctive feature of all diesel locomotives is the pattern of grilles on the bodyside for cooling, air intake, exhaust and so on, and so must be included! Two grilles are set because the array elements were needed earlier in the program during the course of the drawing of the cab, so no additional memory would be required. By using the cursor keys, the bottom left hand and top right hand corners of grille 1 are set, then similarly for grille 2. At this stage the grilles are drawn in outline, but when drawn in detail the grilles are filled with slats and a strut. Because there are 2 grilles, the setting is put into a two pass loop. Perhaps one piece of code needs explaining: the loop counter K% goes 0, 4, (8,. ...) to cope with the four measures needed (bottom left horiz, bottom left vert, top right horiz, top right vert) but the grilles count 1, 2,(3, ...): the number of the grille is displayed. For up to 3 grilles this can be derived by taking the modulo 3 of the loop counter and adding one ((K% MOD 3) + 1). If there are more that three grilles, this won't work — use instead

```
((K% DIV 4) + 1)
```

(which also works for the case of 1, 2 or 3 grilles!!)

There is no reason why you should be limited to 2 grilles. By extending the number of array elements by four for each grille, and increasing the loop counters by four (e.g. for three grilles change line 380 to FOR K% = 0 TO 8 STEP 4 and line 830 to FOR L%=0 TO 8 STEP 4) there could be as many grilles on your diesel as you would like!

You may have noticed a couple of naughty GOTOs in lines 60 and 80; if you try to replace these with something more elegant you may well find yourself attempting to readjust the top right hand corner of grille 2! Here, GOTOs work.

By now you should have an outline diesel locomotive on the screen — by going back to the menu and pressing "0" you should be able to see it "in detail". The maximum height dotted line disappears, the track is drawn fully, detail on the grilles is added.

TABLE 3: LIST OF VARIABLES USED

A%	Flag variable, set to 1 when detail is required
F%	Input for PROCsize: measurement in feet
I%,J%,K%,L%	Loop control variables
N%	Number of windows
R%	B end roof horizontal co-ordinate (calculated)
S%	Output (inches) from PROCsize
V%	1. position at which to draw a wheel 2. outer start position for bogie sideframes
W%	Vertical co-ordinate returned from PROCarrow
Z%	Horizontal co-ordinate returned from PROCarow
CX%	Current position of pointer, horizontally
CY%	Current position of pointer, vertically
H1%	Horizontal pointer position for PROCadjust
H2%	Leftmost horizontal limit for pointer
L1%	Left hand limit for horizontal pointer (PROCarrow)
L2%	Right hand limit for horizontal pointer
L3%	Lower limit for vertical pointer
L4%	Upper limit for vertical pointer
V1%	Vertical pointer position for PROCadjust
V2%	Lower vertical limit for pointer
F1%	Input for PROCsize: measurement in inches
HW%	Horizontal position for drawing cabside windows and door
RR%	B end roof (lower edge) co-ordinate
VB%	Inner start position for bogie sideframes
S$	Name of the part of the locomotive to be adjusted
Y$	General response variable
M%(0)...M%(27)	Integer array (c.f. Table 2)
N%(0)...N%(7)	Array used in character redefinition

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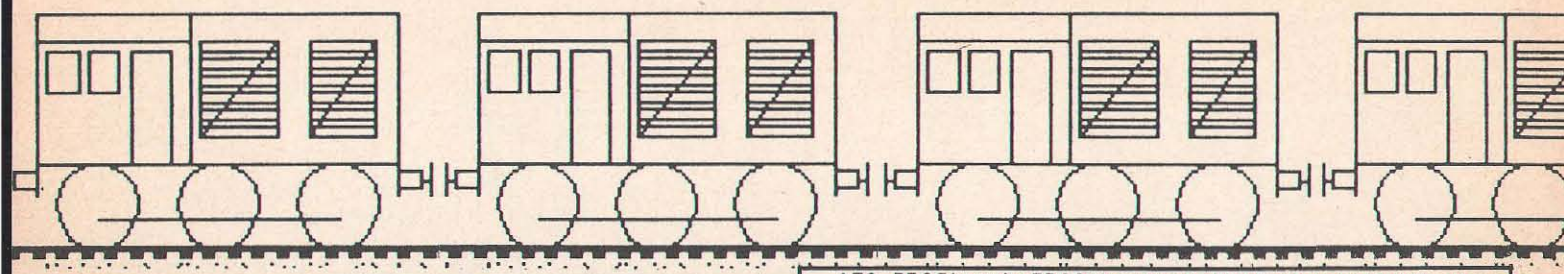


If you are pleased with this locomotive — why not add it to those that can be drawn instantly? If you press ESCAPE then f0 (function key 0) you will see the elements of the array displayed. Also, the cursor keys will have returned to their normal function. Add a new line, e.g.

125 DATA

and using the cursor keys move *across the rows*, copying each entry, and inserting a comma between each one (no comma after the last entry). (If you get any errors after doing this, it is almost certainly due to the omission or addition of those commas — it is very easy to do!)

Add another line, with a description of the locomotive

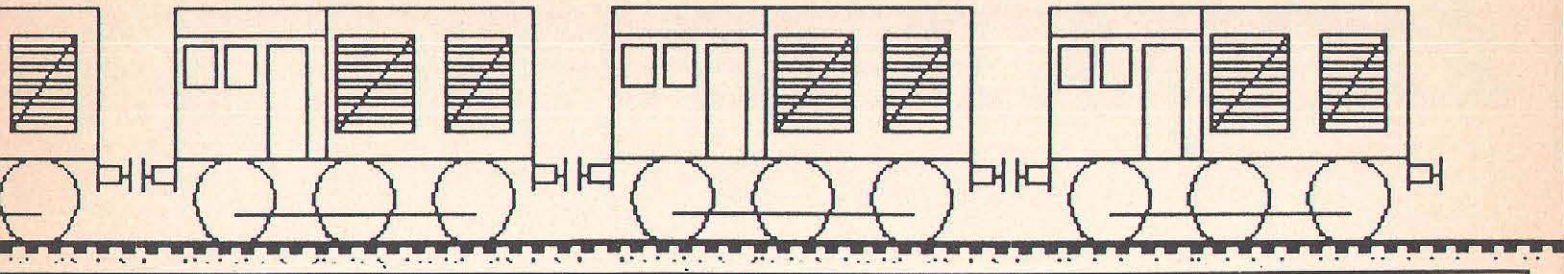
95 PRINT " (your category of locomotive)";TAB(30);"3"

and then *SAVE* the program! Since there is no error checking on the GET$ statement used for the response to these prompts, you can add up to eight of your own locomotives (or ten if you overwrite the demonstration locomotives included). These locos are then instantly available for comparison.

It is a relatively easy matter to write a program that would simply draw a few straightforward diesel locomotives. This program *will* draw preset locos, but is designed to be flexible within certain limits, to allow a very wide range of possible diesel locomotive outlines to be explored, whilst at the same time to be relatively easy and quick to key in. From small diesel railcars to shunters, from freight locomotives to mainline express machines .... Good designing!

PROGRAM LISTING

```
  10 *KEY0 MODE7:P.''''"Array variables:  read acr
oss rows":FORI%=0TO27:P.M%(I%);:NEXT:*FX4,0|M
  20 MODE1:PROCinit:REPEAT:PROCmenu:UNTILY$="Q":M
ODE7:PRINTTAB(15,5);"END":END
  30 DEFPROCmenu
  40 CLS:PRINT'"Outline drawing (latest loco)";TA
B(30);"(O)":PRINT'"New design";TAB(30);"(N)":PRINT
'"Loco from given data";TAB(30);"(L)":PRINT''"Quit
";TAB(30);"(Q)":*FX15,0
  50 REPEAT:Y$=GET$:UNTILY$="O" ORY$="L" ORY$="N"
 ORY$="Q":IFY$="Q" ENDPROC
  60 IFY$="N" PROCnew:GOTO40
  70 IFY$="L" PROCread
  80 PROCdraw:GOTO40:ENDPROC
  90 DEFPROCread:CLS:PRINT"You can choose:":PRINT
''"Diesel shunter";TAB(30);"0":PRINT'"Express pass
enger";TAB(30);"1"
 100 Y$=GET$:J%=VAL(Y$):RESTORE110:FORK%=0TOJ%:FO
RI%=0TO27:READM%(I%):NEXT:NEXT:ENDPROC
 110 DATA7,3,49,148,500,500,427,869,0,96,0,96,0,1
82,0,240,0,272,186,272,624,130,720,240,762,130,840
,240
 120 DATA4,3,40,132,130,872,42,1224,-8,208,6,226,
6,226,26,294,58,320,58,320,334,152,588,260,800,100
,894,268
 130 DEFPROCinit:DIMM%(27):DIMN%(8):VDU28,0,31,39
,20:VDU29,0;500;:*FX4,1
 140 PROCvar:ENDPROC
 150 DEFPROCvar:A%=0:M%(0)=0:M%(4)=200:M%(5)=800:
FORI%=0TO14STEP2:M%(8+I%)=0:M%(9+I%)=96:NEXT:ENDPR
OC
 160 DEFPROCnew:PROCvar:CLG:CLS:PRINT"Double ende
d diesel":PRINT'"or a single ended diesel ?":PRINT
''"for a cab at  EACH  end type   [D]":PRINT'"for
a cab at one end only type [S]":REPEAT:Y$=GET$:IFY
$="S" M%(0)=M%(0)+2:UNTILY$="S" ORY$="D"
 170 PROCtrack:PROCwheelset:PROCcabset:PROCbodyse
t:ENDPROC
 180 DEFPROCdraw:CLS:CLG:A%=1:PROCtrack:PROCwheel
s(3):PROCcab(3):PROCbody:PRINT''"To return to menu
":PROCwait:ENDPROC
 190 DEFPROCwheelset:CLS:PRINT"How many axles on
each bogie ?":REPEAT:Y$=GET$:M%(1)=VAL(Y$):UNTILM%
(1)<7
 200 S$="diameter":REPEAT:CLS:PROCsize(S$):M%(2)=
S%DIV2:UNTILM%(2)<50
 210 IFM%(1)>1 S$="wheelbase":REPEAT:CLS:PROCsize
(S$):M%(3)=S%:UNTILM%(3)>2*M%(2) ELSEM%(3)=0
 220 CLS:PRINT"outside frame to":PRINT'"(bogie) w
heels (Y/N) ?":PRINT''"most mainline diesels have"
:PRINT'"outside frames":REPEAT:Y$=GET$:UNTILY$="Y"
 ORY$="N":IFY$="N" M%(0)=M%(0)+1
 230 PROCwheels(3):S$="start of cab A end bogie":
REPEAT:PROCarrow(M%(4),0,20,500,0,0,S$):IFM%(4)=Z%
THEN240ELSEPROCwheels(0):M%(4)=Z%:PROCtrack:PROCwh
eels(3)
 240 PROCget:UNTILY$="Y":S$="start of cab B end b
ogie":REPEAT:PROCarrow(M%(5),0,500,1100,0,0,S$):IF
M%(5)=Z%THEN250ELSEPROCwheels(0):M%(5)=Z%:PROCtrac
k:PROCwheels(3)
 250 M%(7)=V%:PROCget:UNTILY$="Y":ENDPROC
 260 DEFPROCcabset
 270 M%(6)=M%(4)-M%(2)-48:S$="buffer beam/ bottom
 cab front":REPEAT:PROCarrow(M%(6),0,0,M%(4)-M%(2)
,0,0,S$):M%(6)=Z%:PROCget:UNTILY$="Y":M%(7)=M%(7)-
M%(3)+(M%(4)-M%(6))
 280 PROCcab(3):RESTORE310:FORK%=0TO8STEP2:READS$
:IFK%=0THENPROCadjust(M%(8+K%),M%(9+K%),-40,96,S$)
:NEXT ELSEPROCadjust(M%(8+K%),M%(9+K%),M%(6+K%),M%
(7+K%),S$):NEXT
 290 IF(M%(0)AND2) PROCsingle:ENDPROC
 300 ENDPROC
 310 DATA"start of nose curve","end of nose curve
","bottom of windscreen","top of windscreen","roof
"
 320 DEFPROCadjust(H1%,V1%,H2%,V2%,S$):REPEAT:PRO
Carrow(M%(6)+H1%,V1%,M%(6)+H2%,500,V2%,320,S$):IF(
M%(8+K%)=Z%-M%(6) ANDM%(9+K%)=W%)THENENDPROC
 330 PROCcab(0):M%(8+K%)=Z%-M%(6):M%(9+K%)=W%:H1%
=M%(8+K%):V1%=M%(9+K%):FORJ%=0TO8STEP2:M%(11+K%+J%
)=M%(9+K%):M%(10+K%+J%)=M%(8+K%):NEXT:PROCcab(3):P
ROCget:UNTILY$="Y":ENDPROC
 340 DEFPROCsingle:CLS:S$="cab width":REPEAT:PROC
arrow(M%(6)+M%(18),0,M%(6),1200,0,0,S$):IFM%(18)=Z
%-M%(6)THEN350ELSEPROCcab(0):M%(18)=Z%-M%(6):PROCc
ab(3):PROCget:UNTILY$="Y"
 350 CLS:M%(19)=M%(17):S$="engine compartment hei
ght":REPEAT:PROCarrow(0,M%(19),0,0,96,320,S$):IFM%
(19)=W% THENENDPROC ELSEPROCcab(0):M%(19)=W%:PROCc
ab(3):PROCget:UNTILY$="Y":ENDPROC
 360 DEFPROCbodyset:CLS:PRINT"One or two windows
?":REPEAT:Y$=GET$:UNTILY$="1" ORY$="2":IFY$="2" M%
(0)=M%(0)+4
 370 PROCbody:CLS:PRINT"you can position":PRINT'"
TWO major grilles  (only)":PRINT'"on the body side
":PROCwait
 380 FORK%=0TO4STEP4:G$=" grille "+STR$((K%MOD3)+
1):S$="bottom left hand corner"+G$:M%(21+K%)-96:IF
(M%(0)AND2) M%(20+K%)=M%(18) ELSEM%(20+K%)=M%(6)+M
%(16)
 390 REPEAT:PROCarrow(M%(20+K%),M%(21+K%),M%(6)+M
%(14),M%(7)-M%(14),96,M%(15),S$):M%(20+K%)=Z%:M%(2
1+K%)=W%:PROCget:UNTILY$="Y"
 400 S$="top right hand corner"+G$:M%(22+K%)=M%(2
0+K%):M%(23+K%)=M%(21+K%):REPEAT:PROCarrow(M%(22+K
```



```
%),M%(23+K%),M%(20+K%),M%(7)-M%(14),M%(21+K%),M%(15),S$):M%(22+K%)=Z%:M%(23+K%)=W%:PROCget:UNTILY$="Y"
  410 PROCbody:NEXT:PROCbody:ENDPROC
  420 DEFPROCsize(S$):PRINT"What is the ";S$;" ?":PRINT'"please use feet and inches":PRINT"and press [RETURN]";PRINT';INPUT" Feet    "F%::REPEAT:INPUT" Inches  "FI%:UNTILFI%<12:S%=(((F%*12)+FI%)*2):ENDPROC
  430 DEFPROCget:CLS:PRINT"Is this OK (Y/N) ?":PRINT'"If satisfactory press [Y]":PRINT'"Pressing any other key will":PRINT'"repeat the adjustment":*FX15,0
  440 Y$=GET$:ENDPROC
  450 DEFPROCwait:PRINT'"please press SPACE bar when ready !":*FX15,0
  460 REPEAT UNTIL INKEY(-99):ENDPROC
  470 DEFPROCarrow(CX%,CY%,L1%,L2%,L3%,L4%,S$)
  480 PROCpoint(CX%,CY%,3)
  490 CLS:PRINT"To adjust the":PRINT'S$:PRINT'"use the cursor keys.":PRINT'"To confirm press [RETURN]":REPEAT:PROCpoint(CX%,CY%,0)
  500 IFINKEY(-122) CX%=CX%+2:IFCX%>L2% CX%=L2%
  510 IFINKEY(-26) CX%=CX%-2:IFCX%<L1% CX%=L1%
  520 IFINKEY(-58) CY%=CY%+2:IFCY%>L4% CY%=L4%
  530 IFINKEY(-42) CY%=CY%-2:IFCY%<L3% CY%=L3%
  540 PROCpoint(CX%,CY%,3):UNTIL INKEY(-74):PROCpoint(CX%,CY%,0):GCOL0,3:VDU5:MOVECX%-16,-80:PRINT"^":VDU4:Z%=CX%:W%=CY%:ENDPROC
  550 DEFPROCpoint(CX%,CY%,CL%):GCOL0,CL%:MOVE0,CY%:DRAW50,CY%:MOVECX%,-50:DRAWCX%,-10:ENDPROC
  560 DEFPROCtrack:GCOL0,3:MOVE0,0:DRAW1240,0:IFA%<1THENMOVE0,320:PLOT17,1240,0:VDU5:MOVE50,360:PRINT"maximum height":VDU4:ENDPROC
  570 MOVE0,-2:DRAW1240,-2:FORI%=0TO1240STEP30:MOVEI%,-6:DRAWI%+12,-6:MOVEI%,-10:DRAWI%+12,-10:NEXT
  580 VDU5:FORI%=0TO1240STEP32:FORJ%=1TO8:N%(J%)=2^RND(7):NEXT:VDU23,240,N%(1),N%(2),N%(3),N%(4),N%(5),N%(6),N%(7),N%(8):MOVEI%,-18:VDU240:NEXT:VDU4:ENDPROC
  590 DEFPROCwheels(CL%):GCOL0,CL%:FORK%=0TO1:V%=M%(4+K%):MOVEV%,M%(2):FORI%=1TOM%(1):PROCcirc:V%=V%+M%(3):MOVEV%,M%(2):NEXT:NEXT
  600 IFA%<1 ENDPROC
  610 IF(M%(0) AND1) THENIFM%(4)=M%(5)THENMOVEM%(4),2*M%(2)DIV3:DRAWV%-M%(3),2*M%(2)DIV3:ENDPROC
  620 IF(M%(0) AND1) ENDPROC
  630 FORK%=0TO1:V%=M%(4+K%)-4*(M%(2))DIV3:VB%=V%:FORI%=1TOM%(1)-1:VB%=VB%+M%(3):NEXT:VB%=VB%+8*(M%(2))DIV3
  640 IFA%>0 GCOL0,0:MOVEV%,M%(2)+10:DRAWVB%,M%(2)+10:PLOT85,VB%,M%(2):PLOT85,V%,M%(2):PLOT85,V%,M%(2)+10:MOVEV%+M%(2)DIV3,M%(2)+10:DRAWV%+M%(2)+20,9*M%(2)DIV5:PLOT85,VB%-M%(2)-20,9*M%(2)DIV5:PLOT85,VB%-M%(2)DIV3,M%(2)+10
  650 PLOT85,V%+M%(2)DIV3,M%(2)+10:MOVEVB%-20,M%(2):DRAWVB%-M%(2),2*M%(2)DIV3:PLOT85,V%+M%(2),2*M%(2)DIV3:PLOT85,V%-20,M%(2):PLOT85,VB%-20,M%(2):GCOL0,3
  660 MOVEV%,M%(2)+10:DRAWV%+M%(2)DIV3,M%(2)+10:DRAWV%+M%(2)+20,9*M%(2)DIV5:DRAWVB%-M%(2)-20,9*M%(2)DIV5:DRAWVB%-M%(2)DIV3,M%(2)+10:DRAWVB%,M%(2)+10:DRAWVB%,M%(2):DRAWVB%-20,M%(2):DRAWVB%-M%(2),2*M%(2)DIV3:DRAWV%+M%(2),2*M%(2)DIV3
  670 DRAWV%+20,M%(2):DRAWV%,M%(2):DRAWV%,M%(2)+10:NEXT
  680 ENDPROC
  690 DEFPROCcirc:MOVEV%+M%(2),M%(2):FORJ=0TO6.3STEP0.2:DRAWV%+M%(2)*COS(J),M%(2)*(1+SIN(J)):NEXT:ENDPROC
  700 DEFPROCbuff:GCOL0,3:MOVEM%(6),62:DRAWM%(6),68:DRAWM%(6)-28,68:DRAWM%(6)-28,90:DRAWM%(6),90:DRAWM%(6),96:DRAWM%(6),62:MOVEM%(6)-28,79:DRAWM%(6)-40,79:DRAWM%(6)-40,62:DRAWM%(6)-40,96:MOVEM%(7),62:DRAWM%(7),68:DRAWM%(7)+28,68
  710 DRAWM%(7)+28,90:DRAWM%(7),90:DRAWM%(7),96:DRAWM%(7),62:MOVEM%(7)+28,79:DRAWM%(7)+40,79:DRAWM%(7)+40,62:DRAWM%(7)+40,96:MOVEM%(6),96:DRAWM%(7),96:ENDPROC
  720 DEFPROCcab(CL%):PROCbuff:GCOL0,CL%:MOVEM%(6),96:DRAWM%(6)+M%(8),M%(9):PROCcurveA(M%(6),M%(8),M%(9),M%(11)):DRAWM%(6)+M%(10),M%(11):DRAWM%(6)+M%(12),M%(13):DRAWM%(6)+M%(14),M%(15)
  730 IFM%(14)=M%(16)THENDRAWM%(6)+M%(16),M%(17) ELSEPROCcurveA(M%(6),M%(14),M%(15),M%(17)):DRAWM%(6)+M%(16),M%(17)
  740 IF(M%(0)AND2) MOVEM%(6)+M%(18),M%(17):DRAWM%(6)+M%(18),96:DRAWM%(6)+M%(18),M%(19):DRAWM%(7),M%(19):DRAWM%(7),96:ENDPROC
  750 MOVEM%(7),96:DRAWM%(7)-M%(8),M%(9):PROCcurveB(M%(7),M%(8),M%(9),M%(11)):DRAWM%(7)-M%(10),M%(11):DRAWM%(7)-M%(12),M%(13):DRAWM%(7)-M%(14),M%(15)
  760 IFM%(14)=M%(16)THENDRAWM%(7)-M%(16),M%(17) ELSEPROCcurveB(M%(7),M%(14),M%(15),M%(17)):DRAWM%(7)-M%(16),M%(17)
  770 ENDPROC
  780 DEFPROCcurveA(B%,C%,D%,E%):FORJ=3.1TO1.54STEP-0.2:DRAW(B%+C%)+(E%-D%)*(1+COS(J)),D%+(E%-D%)*SIN(J):NEXT:ENDPROC
  790 DEFPROCcurveB(B%,C%,D%,E%):FORJ=0TO1.56STEP0.2:DRAW(B%-C%)-(E%-D%)*(1-COS(J)),D%+(E%-D%)*SIN(J):NEXT:ENDPROC
  800 DEFPROCbody:GCOL0,3:IF(M%(0) AND2) R%=M%(6)+M%(18):RR%=M%(6)+M%(18) ELSER%=M%(7)-M%(16):RR%=M%(7)-M%(14)
  810 MOVEM%(6)+M%(16),M%(17):DRAWR%,M%(17):MOVEM%(6)+M%(14),M%(15):DRAWRR%,M%(15):IFABS(M%(12)-M%(14))<20THEN830
  820 MOVEM%(6)+M%(12)+8,M%(13):DRAWM%(6)+M%(14)+8,M%(15):DRAWM%(6)+M%(14)+8,M%(13):DRAWM%(6)+M%(12)+8,M%(13):IF(M%(0) AND2) THEN830 ELSEMOVEM%(7)-M%(12)-8,M%(13):DRAWM%(7)-M%(14)-8,M%(15):DRAWM%(7)-M%(14)-8,M%(13):DRAWM%(7)-M%(12)-8,M%(13)
  830 FORL%=0TO4STEP4:MOVEM%(20+L%),M%(21+L%):DRAWM%(20+L%),M%(23+L%):DRAWM%(22+L%),M%(23+L%):DRAWM%(22+L%),M%(21+L%):DRAWM%(20+L%),M%(21+L%):IFA%>0 DRAWM%(22+L%),M%(23+L%):FORI%=M%(21+L%)TOM%(23+L%)STEP10:MOVEM%(20+L%),I%:DRAWM%(22+L%),I%:NEXT
  840 NEXT
  850 IF(M%(0) AND4) N%=2 ELSEN%=1
  860 FORI%=1TON%+1:HW%=M%(6)+M%(14)+12*I%+(I%-1)*2*(M%(15)-M%(13))DIV3:IFI%<N%+1 MOVEHW%,M%(13):DRAWHW%,M%(15)-10:DRAWHW%+2*(M%(15)-M%(13))DIV3,M%(15)-10:DRAWHW%+2*(M%(15)-M%(13))DIV3,M%(13):DRAWHW%,M%(13)
  870 IFI%>N% MOVEHW%,96:DRAWHW%,M%(15)-10:DRAWHW%+48,M%(15)-10:DRAWHW%+48,96:NEXT ELSENEXT
  880 IF(M%(0) AND2) ENDPROC
  890 FORI%=1TON%+1:HW%=M%(7)-M%(14)-12*I%-(I%-1)*2*(M%(15)-M%(13))DIV3:IFI%<N%+1 MOVEHW%,M%(13):DRAWHW%,M%(15)-10:DRAWHW%-2*(M%(15)-M%(13))DIV3,M%(15)-10:DRAWHW%-2*(M%(15)-M%(13))DIV3,M%(13):DRAWHW%,M%(13)
  900 IFI%>N% MOVEHW%,96:DRAWHW%,M%(15)-10:DRAWHW%-48,M%(15)-10:DRAWHW%-48,96:NEXT ELSE NEXT
  910 ENDPROC
```

Bookshelf Books

Liven up your computer library with a new literary angle on Acorn machines.

Two books specifically for the BBC or Electron in the classroom this month are: **File Handling on the BBC Microcomputer** by Brain Townsend, published by Macmillan at £6.95 and **Mathematical Programs in BBC BASIC** by Alan Whittle, published by Prentice Hall, price £7.95.

File Handling is incredibly comprehensive, from simple file processing with a cassette system to a full scale random access database. The book is a highly useful reference work for the computer science classroom. The vast amount of theory and documentation is tightly packed and sometimes a bit difficult to fathom but the actual program examples are a breath of fresh air, structured and easy to follow.

A number of self-test exercises reinforce the work as a text book. Although much of the material is available elsewhere in various guises, File Handling brings it all together for anyone studying the subject in conjunction with the BBC or Electron. It would also make a good teach yourself for anyone contemplating the hard slog of writing their own database or needing to know how much of the software they are using operates.

Maths Programs is specifically aimed at the mathematics classroom at GCEA-level standard, leading up to first-year degree work. All the programs are suitable for BBC and Electron. There are 32 programs in all, covering a wide range of subjects, taking the form of demonstrations, graph plots, Venn diagrams, equation solving, matrix multiplication and so on.

Alan Whittle has taken a very sensible approach to the construction of the programs which means that keying them in is mainly a matter of building up a set of general procedures and adding the relevant extras for each program. It is often the case that mathematical ideas are clarified by their implementation in BASIC for the microcomputer, so there may be benefits beyond the actual running of this excellent suite of programs.

PICS FOR THE KIDS

Graphics for Children on the BBC Computer by Gwyneth Pettit, published by Sigma for £6.95 also contains its fair share of maths. It is however squarely aimed at the youngster or beginner to computer graphics. I am not aware of an Electron version but all the programs and explanation are equally relevant to it.

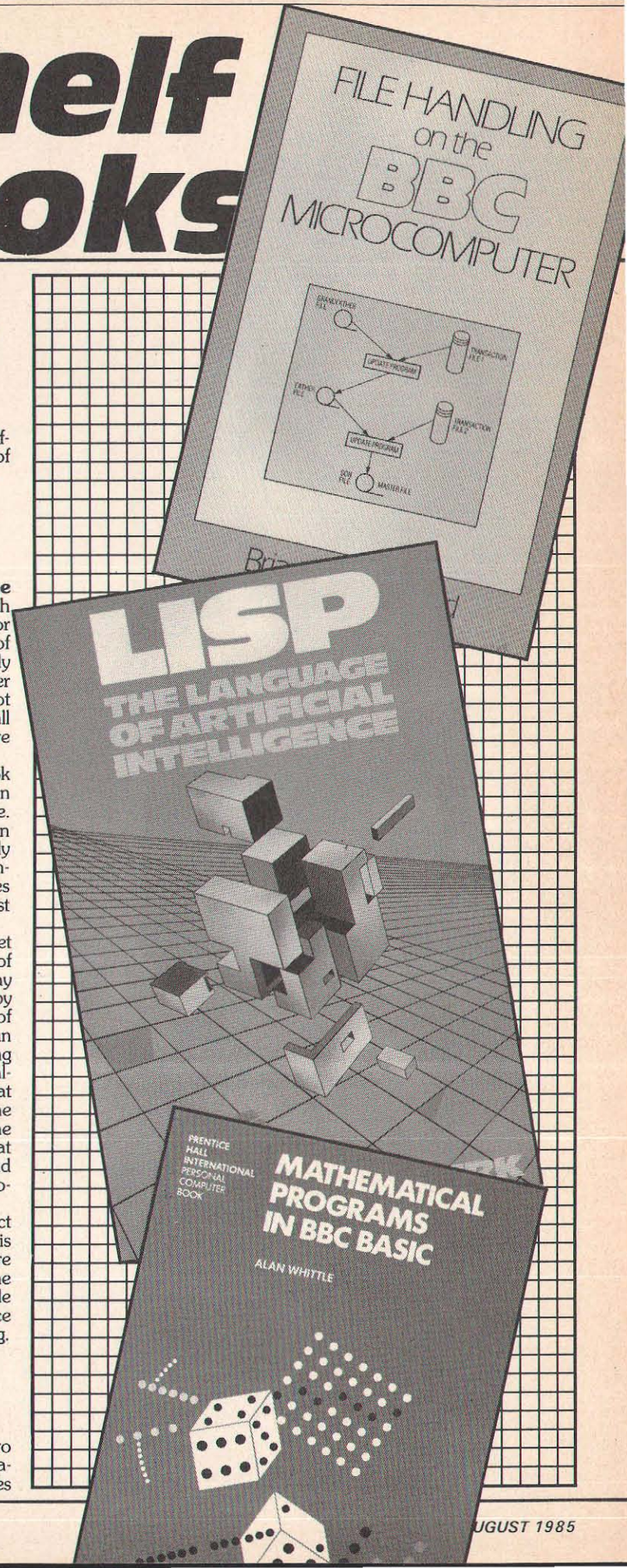
The initial parts of the book cover general ground, explanation of computer terms and hardware. The graphics control available on the BBC and Electron is gently introduced amongst a large number of simple procedural routines which serve to retain interest amongst the explanatory text.

PLOT, VDU and GCOL all get the treatment with explanation of the 16 colour pallette and the way in which it can be manipulated by the operating system and by use of logical operators. As well as the fun examples, there is a look at putting graphics to work in business (although it should be stressed that not only business benefits from the clarity of computer graphics). The most ambitious section looks at Computer Aided Drawing,and implements a demonstration program.

Graphics are a popular subject and, now that their real value is being recognised, will feature more and more prominently in the world. This book is a nice gentle introduction with a good balance between enjoyment and learning.

BBC PERFORMS AT SALZBURG

After graphics, music on the micro must be the most popular application for the young. Kevin Jones



has written **Exploring Music with the BBC Micro and Electron.** It's published by Pitman and sells for £9.95.

It's a large format book and distinctively portrays a young Beethoven playing the BBC keyboard! The most interesting piece of information on the dust cover is the fact that the author has had one of his orchestral works, with a part for the BBC Micro, performed in Salzburg! You learn something new every day.

Actually this is a very nice book to read. The large format means that the text is not as crowded as some of the technical books we usually encounter in the computer field. It proves to be an introduction to sound and music in general with the computer as an aid to learning. Of course, you discover much about how to produce sounds through software but the angle of approach is always from the musical angle.

The programming technique is not as suited to this sort of manual as I would have liked but none of the programs is long enough to create any confusion. Within some of the programs there is considerable use of the random factor and no real attempts to get into the area of probability tables to replicate musical styles.

Although not a complete exploration of making music on the BBC, this book is an attractive introduction and should prove valuable in the music classroom.

IN GENERAL

There are a number of general publications which BBC and Electron users may well wish to note.

The **Epson Printer User's Handbook** by Weber Systems and published by Century for £9.95, is the best Epson manual so far. If you use your printer for graphics, for producing various text styles, foreign language fonts etc, this is the book for you.

Followers of Personal Computer World can also take advantage of Century's compilations of their Subsets on 6502 and Z80 programming, £7.95 each. Also of interest to the programmer, this time in Lisp, is **Lisp, the language of artificial intelligence** by A.A.Berk, published by Collins for £9.95. All the material is relevant for Acornsoft Lisp users and the book is good background to anyone coming anew to one of the BBC or Electron Logos.

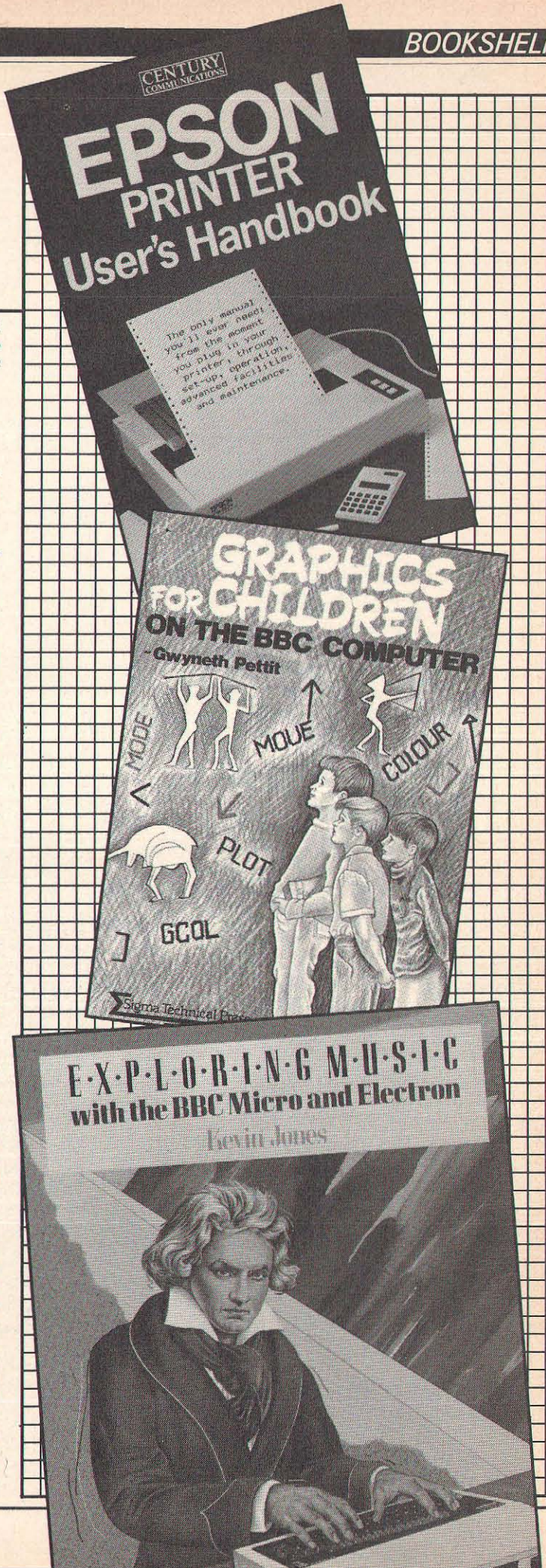
ADVANCED PROGRAMMING

Micro Advanced Programming Joe Telford (Prentice-Hall, £9-95, pp 392) is concerned primarily with programming for serious applications, with the emphasis upon the professional design of programs, exploiting the structures of BBC BASIC to the full.

There is, for example, much discussion of techniques for handling data structures in memory and on disc. A number of interesting programs are given including simulations (eg of stacks and queue structures) and demonstrations of techniques such as fast sorting in memory and using random access files on disc.

Telford does not assume very much prior knowledge of programming, in spite of the title of the book, but some familiarity with BASIC and access to the User Guide for reference material is essential. The book would, for example, be an excellent introduction to the BBC micro for someone who had learned programming on another machine with a more modest implementation of BASIC.

Where BBC BASIC has limitations, these are pointed out and the structures available in other languages, such as the CASE statement, are explained. In later chapters Telford deals with some topics which are machine specific, eg how to program the user and analogue ports and the use of graphics and sound. A possible criticism is that the author perhaps tries to cover too many topics with the consequence that some are not treated in sufficient depth. The book should, however, prove very useful in educational contexts where principles of computer science are being taught by use of the BBC Micro. It is also packed with information and programs which should prove useful to anyone wishing to learn serious programming of the machine and is recommended as a very good buy at the price. **JE**



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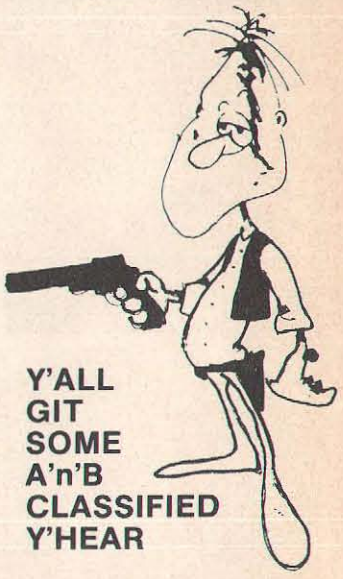

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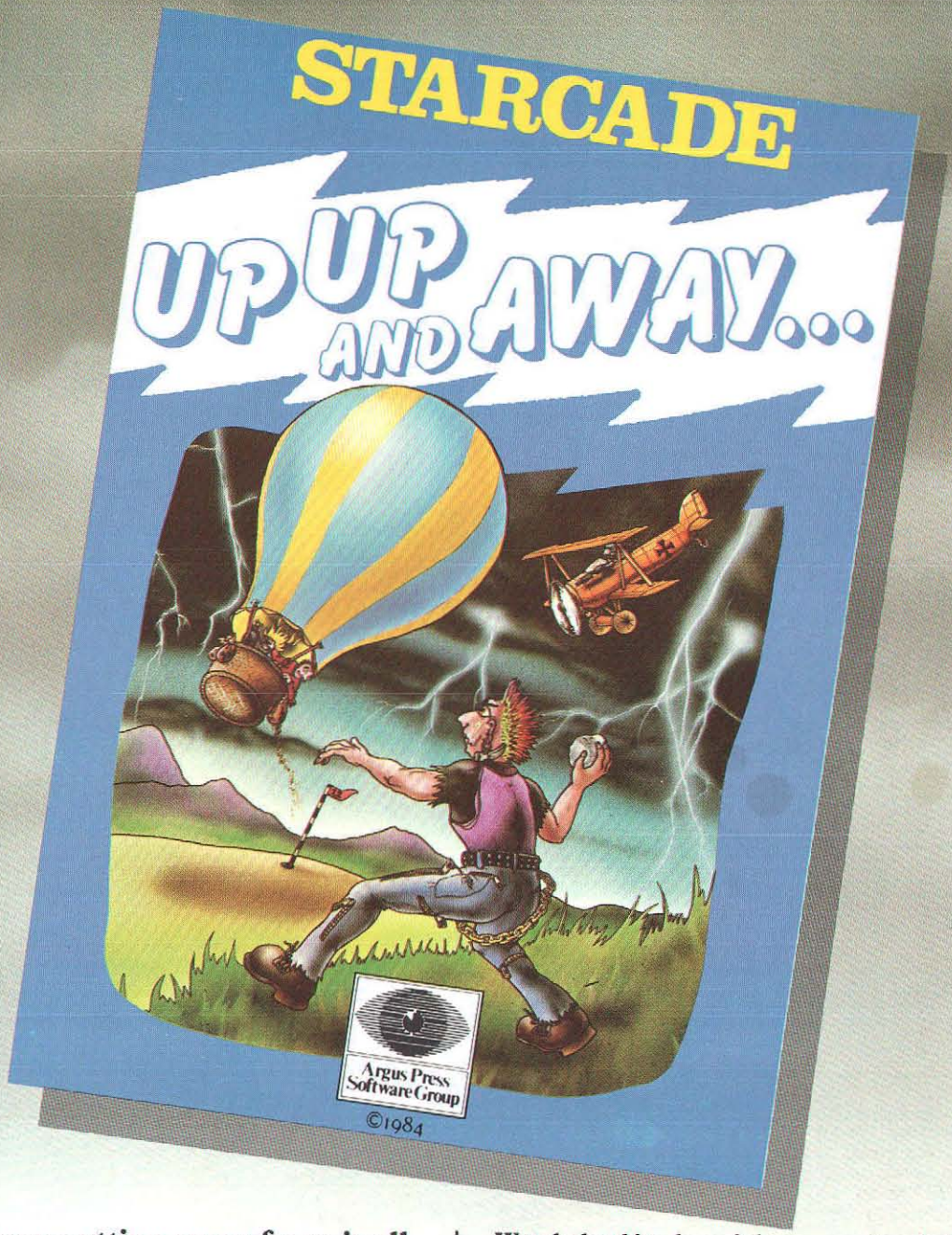

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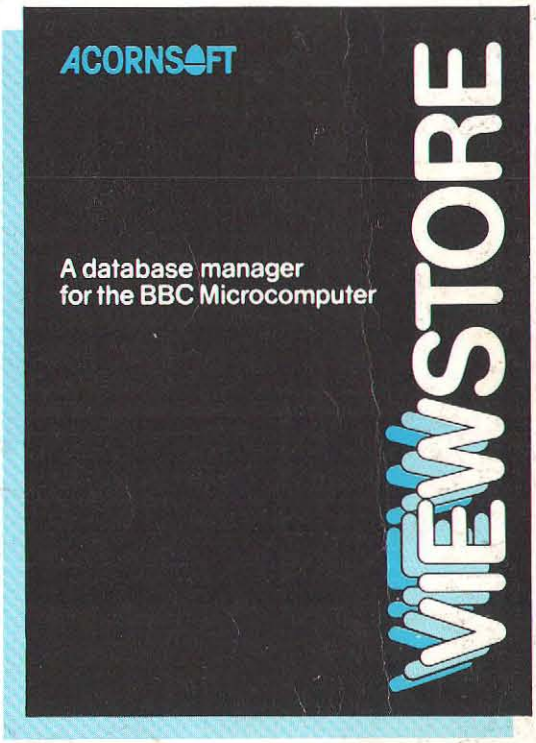

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